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

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

Summary

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

Conclusions

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

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State of Iowa

1926

REPORT OF THE

STATE APIARIST

FOR

The Year Ending December 31, 1926

Also Report of the Convention of the Iowa Beekeepers' Association in Des Moines, November 17-18, 1926

F. B. PADDOCK, STATE APIARIST
Ames, Iowa

Published by
THE STATE OF IOWA
Des Moines

LETTER OF TRANSMITTAL

HON. JOHN HAMMILL, *Governor*—

SIR: As required by law, I herewith transmit to you my fifth annual report as State Apiarist, for the year ending December 31, 1926.

F. B. PADDOCK, *State Apiarist.*

Ames, Iowa, January 10, 1927.

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REPORT OF STATE APIARIST

The winter loss of 1925-1926 was unusually heavy for Iowa beekeepers, the early cold weather preventing many from properly preparing their colonies for winter. The chief difficulty was lack of stores in the brood nest, accompanied by a very small population of young bees. Many became indifferent to the outcome and left their bees to the mercy of the elements. Following a disastrous winter came a very unfavorable spring. Bees without any protection during the winter succumbed readily with the cold damp weather in spring. Cellared bees required careful attention, in the form of feed and uniting. Bees in packing were much better able to cope with the situation. They could take feed better and brood up more readily. Under such conditions robbing was more prevalent and this resulted in an abnormal spread of disease which took its toll throughout the season and will extend into the following season.

With the heavy losses experienced many beekeepers attempted to make as much increase as possible. This resulted in most of the colonies being under full strength when the honey flow started. The flow was spotted over the state but in the areas where it was good the results were excellent. An outstanding feature of the season was the unusually heavy flow from basswood. In many localities this meant that climatic conditions were favorable during the period of bloom for nectar secretion and for the bees to gather all the nectar that was produced. This large amount of basswood changed the color, body and flavor of honey of some who experienced difficulty, disposing of their crop to regular customers. The result of the season was estimated at a 70 percent crop for this state. In any review of the season it must be recalled that the rapidly increasing acreage of sweet clover is highly beneficial to the honey producer. The future of the beekeeper is linked closely with a progressive program for agriculture.

The problem of marketing was met in the usual way, those who had a good crop felt that it was necessary to dispose of their entire crop as soon as possible. No effort was made to ascertain crop conditions over the state or the United States. Some were almost desperate to sell honey before the market was established. The result was that much honey was offered at an inopportune time

and prices were therefore wholly unfavorable. Three months after the harvest finds many searching for honey to supply a yearly trade. The present method of putting honey on the market is the real menace to the development of the industry. Honey is in a class by itself in as much as such a large proportion of the production is prepared by the producers. The needs of the consumer are not consulted, no demand is created and no effort is made to alter the situation. There is an increasing tendency on the part of the larger and more careful producers to consult the problem and work on its solution. More honey is being carefully marketed each year and the results are highly satisfactory.

It cannot be said that the problem is over production, rather it is entirely a matter of under consumption. In the United States the consumption of honey is placed at two pounds per capita, exactly where it was in 1914. During the same period the consumption of sugar has increased from 70 to 116 pounds per capita, almost 66 percent. If honey consumption had kept pace it would mean 154,000,000 pounds more than at present. This amount is not being produced in the United States and cannot be imported without bidding against other countries where honey consumption is from 11 to 33 pounds per capita. Our over-production now is 25 percent, which is being exported.

While the marketing problem is most discussed now, it is not our only problem. The matter of increased efficiency of production is confronting the producer of honey. The complaint is made now that honey is sometimes sold for less than the cost of production. The only way to meet such a situation is to produce more efficiently. The factors which may contribute to the solution of this problem are, better stock, better equipment, better management and better disease control.

For the past decade the plea has been made to have all colonies headed with good Italian queens. This has resulted in an increase in honey production, but now it is necessary to go farther. More advance must be made in high producing strains of bees. Furthermore, it is too much to expect that the Italian race is the best under all conditions. It is a well known fact that the Carniolan and Caucasian races of bees are more hardy and experience has proved that they are more vigorous under the colder climes of the United States. More honey is being produced by many beekeepers who have adopted these races.

Beekeepers have always prided themselves on the length of service of hives and brood combs. This may not be in accord with efficient production. The best equipment, well taken care of and replaced occasionally may be better. Too much cannot be said of efficient brood combs. The manufacturers of foundation have rendered a service in this direction. A frame well nailed with a full sheet of foundation properly in place is the start for a good brood comb. It may have to be replaced in 3 to 5 years, as is now being done by some producers.

The management of bees is a science based upon a thorough knowledge of bee behavior. To obtain a colony of maximum population, to prevent swarming, to super in a way to get the most honey stored from the available nectar, to locate outyards, are all factors which may hold down the cost of production. Disease is one of the most apparent items in the high cost of production. More attention must be given to reducing the toll taken by disease and it cannot be done by regulatory methods.

The educational work conducted along the lines just discussed is well organized in the demonstration apiary project. This is carried on through the Agricultural Extension Service with five seasonal meetings at each apiary. There are five colonies in the demonstration and other colonies are kept as check colonies. Careful records are kept so it is possible to emphasize the need of good stock equipment and management. By increasing the yield per colony it is possible to lower the cost of production. The object of the demonstration apiary is to put into local practice the theory which is given in the lectures.

There were in 1926 forty-three demonstration apiaries in nineteen counties which produced 15,813 pounds of honey. Check colonies in these apiaries produced 7,473 pounds of honey more than the state average. The cash gain of honey produced was $3,162.50. The value of colonies and equipment was $2,415.00, making a total direct benefit of the work $5,577.60 to the cooperators. The total increase from visitor's yards who adopted the methods was $20,640.00, which gives a grand total of $26,217.00 added income to the people of Iowa who were reached through this work.

The inspection work of the season is given in detail in an article later in this report. It does not seem necessary to given an account of the activities at this time. The work was the most satisfactory that has yet been conducted for it is possible to show real results in disease clean-up. The work was extensive and

shows a very high percentage of disease. This is due to the fact that the work was conducted in disease areas.

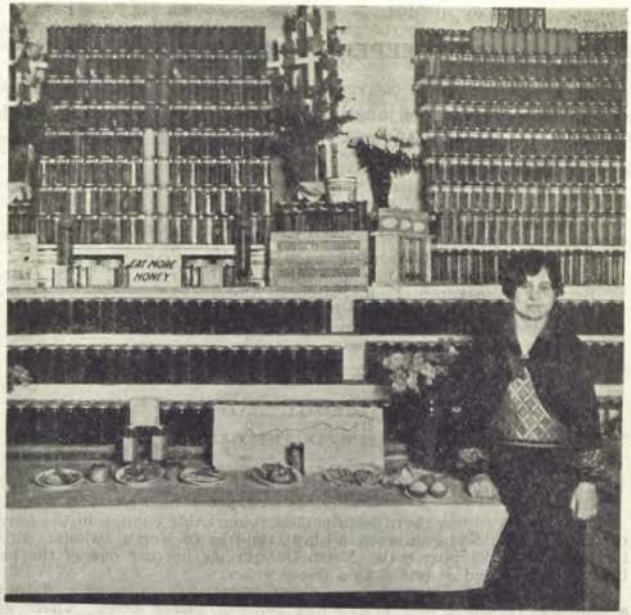
The beekeepers short course was held during the Farm and Home Week, February 2-6, 1926. Beekeeping has made such a rapid advance during the last few years that beekeepers must make an effort to keep abreast the times. Even those who have the inclination and time to follow improved methods closely by reading, derive great benefit in being able to attend school. It is possible to bring out many things with proper emphasis which will result in a clear understanding and cause the beekeepers attending the course to carry the knowledge back to his community and put it into practical use.

During the past eight years correspondence courses have been offered which have proved popular and satisfactory. Many beekeepers are not able to attend resident instruction but are anxious for self-improvement, which give a place to the correspondence course work. There are now 203 students enrolled in the Beginners' Course and 46 students in the Advanced Course. Of the enrollment 65 have completed the Beginners and 24 have received certificates from the Advanced Course.

The Beekeepers Bulletin, a quarterly publication, has been continued through the year. This is sent to a mailing list of 16,500 names who have manifested an interest in keeping bees. The results of this contact with the beekeepers of the state every three months is highly satisfactory. The distribution is being extended each year to include more states. It is possible to effect a closer cooperation with beekeepers through the Bulletin.

During the year Extension Service Bulletin No. 138 was issued. This 16-page bulletin written by the State Apiarist covers briefly but in concise manner the diagnosis and treatment of the apiary diseases and pests. Its distribution is already extensive and requests indicate that it will be of service to beekeepers in waging their fight against these difficulties.

Assistance was given two fairs by the State Apiarist. At these fairs many thousand questions were answered for beekeepers and the public in regard to bees and the use of honey. The Iowa State Fair had the best exhibits of honey and bees ever shown. The State Apiarist served as assistant superintendent in charge of the apiary department.. At the Mid-West Horticultural Exposition the State Apiarist served as superintendent of the honey products department.



Miss Fischer demonstrating uses of honey in food at Horticultural Exposition

As Secretary-Treasurer of the Iowa Beekeepers Association it has been possible to effect very close cooperation of all the agencies interested in beekeeping. The efforts of the Association have always been in support of any and all educational efforts and inspection work. In conjunction with other associations meetings were held during 1926 on two circuits, of Nebraska, South Dakota, Minnesota and Iowa and the Wisconsin, Illinois, Iowa and Minnesota. The first circuit meeting was held in June at Sioux City and at Platteville, Wisconsin, in August for the second circuit.

BEEKEEPER'S CONVENTION

The fifteenth annual convention of the Iowa Beekeepers' Association was held in conjunction with the annual meeting of the State Horticultural Society at the Chamberlain Hotel, Des Moines, November 17 and 18, 1926.

OFFICERS FOR THE CURRENT SEASON

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

PAPERS READ BEFORE THE CONVENTION

BEEKEEPING IN THE DAKOTAS

By Frank C. Pellett, Hamilton, Ill.

Bees in North Dakota

Nowhere else has there been such a remarkable change in the honey producing possibilities in such a short time as in North Dakota. From the poorest beekeeping state, North Dakota has become one of the best in the short period of less than a dozen years.

My first trip to that state was about twenty-five years ago. I found a beautiful region of new prairie and fields of golden grain. There was little general farming; farmers were not interested in livestock, and no meadows except the wild prairies were to be seen. A friend of mine who had homesteaded not far from Ellendale had been a beekeeper before going there. He said that bees could not live in North Dakota because there was nothing for them to live upon, and, if there was, the wind blew so hard that they would be unable to maintain themselves. Later developments have shown that he was mistaken in his estimate as far as the winds are concerned, and there is no longer room for complaint of lack of bee pasture.

The change has come about as a result of the change in agricultural practice in recent years. Farmers still grow wheat in large acreage, but they have found it necessary to grow something else in rotation in order to maintain the yield. Sweet clover is the one crop which is generally grown as a soil builder. It is the best thing known for that purpose, and in addition it furnishes more pasture for animals per acre than anything else within reach. Diversified farming is coming in and the one-crop farmer has nearly disappeared from the northern plains region.

It was only about five years ago that the outside world began to hear about beekeeping in North Dakota. In fact, the last census reports only 708 hives of bees for the entire state as against 495 hives in 1910. A few kept bees for many years with moderate success; some secured good crops, but the world at large knew nothing of it. When farmers began planting sweet clover those who had bees piled up the honey in a way to surprise the natives. Naturally they decided that it would be well to get more bees. Unusual success always attracts attention, and a man who succeeds with any enterprise is likely to be surrounded by others who attempt to duplicate his effort.

A big story that started a boom—F. C. Bennett, at Jamestown, was one of the big pioneer beekeepers. About six years ago he secured 360 pounds of comb honey from one colony of bees. At that time honey sold very high in North Dakota. Boom prices prevailed generally and there was little honey to be had. He accordingly sold much of his honey for 50 cents per section. His total receipts from one hive of bees was $150.00 cash. Such a story was too good to keep and he told in detail what he had done in a letter to A. I. Root. The beekeeping world never saw a more enthusiastic booster than this man Root, and he published the story. Naturally such a big story inspired a good deal of doubt in the minds of many well-informed beekeepers whose experience had been obtained outside the sweet clover region, but it led to investigation. About this time R. L. Webster became State Entomologist. Webster has always had a high regard for the possibilities of beekeeping as a business.

F. E. Bennett of Jamestown, North Dakota

After looking into the situation he began to call public attention to the fact that North Dakota was overlooking a real opportunity. On Webster's invitation I made my second trip to the state and was amazed at the change that had taken place. My impressions appeared in the March, 1923 issue of the American Bee Journal. Not many commercial beekeepers were established, but those on the ground were getting better crops of honey than were reported elsewhere. During the past five years expansion has been very rapid, especially in the Red River Valley.

The season just passed is reported as the poorest since beekeeping became an important industry, but it has been far from the failure that most of us have known in other regions. After keeping bees for many years in a white clover location where an average of 100 pounds of surplus honey per colony would be considered a big crop, it is hard to believe the stories one hears of an average of 250 pounds per colony or more, which are so often obtained in the sweet clover districts.

After all, it is not the occasional big crop, but the ten-year average, that counts. Bees have been kept in the Dakota sweet clover country long enough to make it appear safe to say that the average returns are equal if not better than those obtained anywhere else in America.

Extent of Sweet Clover

In a recent advertisement, the Great Northern Railway called attention to six counties in its territory with more than fifteen thousand acres of this crop. Grand Forks county leads with an area of 27,053 acres. Ramsey county comes next with 24,782 acres. Pembina county is the lowest in the list with 15,120 acres. Cass, Towner and Nelson counties are also included with more than the acreage list for Pembina.

Because of the publicity that has attended the success of the beekeepers in the Red River Valley, most of the new recruits who have engaged in the business on a large scale have gone to that section. A trip across the state, however, shows clearly that there are numerous localities where there is a large acreage of sweet clover available and no bees to gather it.

The man who is looking for a location in North Dakota will do well to visit that state in summer and take long drives through the counties where beekeeping has not yet developed. By going to unoccupied locations he will have less competition in the local market in disposing of his crop and will face fewer complications over questions of prior rights, exposure to disease, etc. In driving for hundreds of miles over the state was impressed with the fact that North Dakota has an immense area of potential beekeeping territory. In some neighborhoods I found little sweet clover, while a few miles distant there were large fields. In some western counties the acreage was surprisingly large, although it varies greatly from year to year. It is not necessary to settle in a section where there are already several bee men present, for there are whole counties without a commercial honey producer as yet.

In neighborhoods where livestock and dairy are becoming important one finds the best opportunities. In too many cases the sweet clover, grown for soil building purposes only, is plowed under before it blooms, and then the beekeepers are out of luck. I met some beekeepers who have been in the state for several years who found it necessary to move most of their bees the past season to new pastures because the sweet clover on which they formerly depended had been turned under. This is the uncertain feature of the Dakota region and one that the beekeeper should look into carefully before settling permanently. In years when seed prices are high there will be ample bee pasture in sections which will plow it all under when seed prices are low.

The Sweet Clover Region

After my former trip I wrote as follows in the American Bee Journal for March, 1923:

"In the writer's opinion the greatest honey producing region in America will shortly be found from northwestern Iowa, northeastern Nebraska, northward through the Dakotas and prairie provinces of Canada. The reason for this opinion is simply that sweet clover is regarded as the greatest of honey plants in America, and sweet clover is found at its best in this region."

The prophecy has been fulfilled, and what has already been done is but a small part of what will yet come. Sweet clover is extending its range every year and is being planted in neighborhoods where it has not previously grown. The areas where bees can be kept profitably then years hence will be much greater than the areas now available, yet the bees have not yet reached nearly all of the territory where sweet clover is already planted in substantial acreage.

Good years are always followed by poor ones, and the present season in the sweet clover section will only serve to call attention to the fact that a sweet clover region is the safest of all. Instead of the total failures which often prevail in other sections, they still have some honey to sell, in many cases an amount equal to what we would call a fair crop in less favored sections.

The Reason Why

Sweet clover is grown in many places where it fails to yield nectar in the generous manner that it secretes in the northern plains. The plant seems to find conditions in this region favorable to a maximum secretion. Rich limestone soils, a moderate amount of moisture, long days of sunshine, with moderately cool nights, seem to meet its requirements fully. In the corn belt, with its hot nights following the hot days, we do not find such yields of honey, although it does well there. Thus in southern Iowa it yields less freely than in the northwestern part of that state.

Nearly all of North Dakota, except small areas of Badlands, has rich loam soils with clay subsoil. The physical condition is such as to cause a low evaporation of moisture. Although the precipitation is rather light for the entire state, for the most part rain falls during the growing season, from April to September, when it is of most value. The frost-free season is short. Summer comes late and winter comes early. We thus find a short, intensive season, with bees active from its beginning until its end. When the crop is over the bees stop brood rearing and consume a minimum of stores until time to begin the next year's operations. It thus happens that a much greater part of the honey gathered finds its way into the supers and later to market than is the case where brood rearing is continued through a longer season. A moderate variation between day and night temperatures which always occurs in this latitude seems to be an important factor in the large yields.

The beekeeper in this region in seeking a location must find first a sufficient area of sweet clover within reach. Next he should look for early blooming trees and plants to stimulate spring brood rearing. Willows, maples, box elders, elm, dandelions, etc., are second in importance only to the principal pasture crop. On these wind-swept prairies the selection of the immediate apiary site is also very important. A location with good wind protection is worth a great deal. Bees build up very much faster and consume less stores in a situation where they are protected from the winds. Groves are not always within reach and too many apiaries are placed in the open with no windbreak.

Bee Men and Their Problems

The change that has taken place so quickly has brought new problems to the beekeepers. Formerly the crop could be sold in the local market at top prices. Now the output is so large that distant markets must be sought. The beekeepers are seeking some means of distribution which will enable them to avoid competition with each other in selling and at the same time move the honey at a fair price.

The College of Agriculture is lending its assistance in inspection and making a serious effort to prevent the spread of disease among the bees of the state. J. A. Munro, State Entomologist, has recently taken up the work here, but he has had considerable experience with beekeeping and knows the honey producers' problems.

Although the State Beekeepers' Association is a comparatively new organization, the meetings compare favorably in attendance and interest with those of long standing.

In addition to the problems already mentioned of finding a market for their crop, and of the tendency to plow under the sweet clover before it blooms, Dakota bee men have a very real problem in getting their colonies ready for the harvest. They are fortunate in the fact that the

harvest comes late thus giving them a long period in which to build up weak colonies. However, the long winters and cold windy spring weather are very hard on the bees. The most expert beekeepers find it difficult to carry their bees through from the close of one crop to the beginning of another. Winter and spring losses are heavy and it often happens that the bees will seem to be almost at a standstill for weeks at a time in spring. While the region offers good bee pasture, it also requires good beekeeping to get the big crops, and it is no place for a man to undertake large scale operation unless he knows his business.

Honey Production in South Dakota

South Dakota has areas of the best bee pasture and also some of the poorest. There are locations where honey production cannot be excelled, and other parts of the state offer such poor pasture that bees can scarcely maintain themselves. As in North Dakota, sweet clover is the important factor. Where it is grown in large acreage the bees do well, and where it is not present we seldom find much for the bees. South Dakota, however, has made a great contribution to the prosperity of the beekeeping industry in the introduction of hardy forage crops through the College of Agriculture. The man who has done the work is not a beekeeper, yet few men have done as much for the industry as he.

Prof. N. E. Hansen, of Brookings, is a great leader in plant breeding. He has made many trips to far places in an effort to find hardy plants suited to the climate of the wind-swept plains. From Russia, Siberia, and north China he has brought forage plants, hardy fruits and flowers, and established them in South Dakota. Those which have done well here he used as parents in his plant-breeding work or has introduced them to the farmers of the state. As a result of his work many fine fruits are to be had on the farms of the Northwest, where a generation ago, only cherries and buffalo berries were to be had. He crossed the hardy sand cherry of the plains with the high quality Japanese plums and produced new fruits with the hardiness of the one and the quality of the other. Millions of seedlings have been grown in an attempt to find new and better things suited to a region of severe climatic changes and light rainfall. The success that has attended these efforts is worthy many times the money spent for the support of the entire agricultural college.

Space will not permit mention of all the interesting things which have been done with plants by Professor Hansen. His ten acres of roses, all grown from seed of selected crossing is worth a story all by itself. He finds it necessary to grow from a hundred thousand to a half million seedlings to find one new one worthy of propagation. So far, only two new roses, the Tetonkaha and the Tegala, have been offered to the public as a result of this work. Apples, pears, plums, cherries, berries and flowers all receive attention on the South Dakota plant-breeding grounds.

The thing of special interest to our readers, however, is the part which Hansen has had in improving the bee pasture of the western states. He brought from Semipalatinsk, Siberia, a sweet clover which grows well in a region with only eight inches of annual rainfall and temperature changes ranging from 50 degrees below zero to more than 100 above, Fahr. This sweet clover, known as the Hansen, should be secured by every beekeeper in the arid regions of our western states. It will grow where the common sweet clover cannot survive and provide bee pasture in sections where no bees can now be kept. It is hardy also in the far north and has been widely distributed in western Canada under the name of "Artic" sweet clover. It does well in sections so far north that the common kinds winter kill, thus greatly extending the honey-producing areas to the north as well as to the west. From the same region he brought the Semipalatinsk alfalfa which succeeds in regions too dry for other alfalfas to grow. Hansen seems to be one to whom ancient prophecy referred when it was said, "the desert shall blossom as the rose," for he is literally bringing it to pass.

From European Russia, a region colder than South Dakota, he brought the Cossack alfalfa, one of the hardiest generally introduced. The past summer was very dry in parts of South Dakota. In driving over the state I was greatly impressed by the fields of this alfalfa in neighborhoods where other crops had been nearly destroyed by the drouth. Farmers with fields of Cossack alfalfa had feed for their animals and pasture for their bees, where all around fields were bare and burned. A season like the past one is sufficient to call general attention to these drouth-resisting crops which have been introduced, and we may expect a great increase in the acreage planted in coming years. Wide distribution is being secured for promising forage crops by giving free a few seeds. Those who receive them can soon grow a considerable quantity of giving them careful attention.

The College Beekeeper

For some time past the College of Agriculture has been offering some work in beekeeping. The work so well started by Prof. R. M. Gilcrist is being continued by M. D. Farrar. Demonstration apiaries have been established and a course in beekeeping in offered at the college By co-ordinating extension work with research and teaching, it is hoped to meet the needs of the industry. The extent of the work very naturally will depend much upon the interest manifested by the beekeepers. Farrar secured his training under Paddock at the Iowa State College. Since sweet clover is one of the important farm crops of the state, a timely experiment is under way to determine the extent to which the plant is dependent upon the honeybee in pollination.

Physical Features of South Dakota

Situated in the northern plains region, South Dakota has a climate of extremes of heat and cold, wet and drouth, yet it is rapidly becoming one of the best beekeeping states, due to the increased acreage of sweet clover.

For the most part the state is composed of comparatively level prairie with rich soil. The general elevation east of the Missouri River is about 1,500 feet above sea level. There is a rise westward to about 3,200 feet at the eastern border of the Black Hills. This mountainous area rises to 6,000 feet and at the highest 7,200 feet.

The state as a whole is deficient in rainfall, the general average of the west half being slightly more than 18 inches annually, with about 22 inches in the eastern portion. Most of the precipitation usually comes in the growing months, from April to September, so that good crops are grown in normal seasons.

There are marked extremes of temperature. Days when the thermometer registers above 100 degrees, Fahr. in summer, are not uncommon, and below zero temperature in winter are frequent. The lowest recorded is 57 blow zero, at Camp Cook, in the western end of the state.

The good beekeeping locations in the eastern half of the state are mostly confined to neighborhoods where sweet clover is grown. While Alfalfa yields nectar in South Dakota, it is not equal to sweet clover in this region. Large yields from sweet clover are the rule where sufficient pasture is available. Since the acreage grown in rotation and also for pasture for livestock is rapidly increasing, the beekeeping possibilities in some sections are very promising.

Farmers Keep Bees

The change in agricultural practice in recent years has been marked. Diversified farming is now the rule in many neighborhoods where grain farming was formerly followed. Folsland Brothers, at Oldham, are good examples of this change. The family for many years raised mostly

wheat, until diminishing yields compelled a change. They began growing sweet clover to restore the soil fertility. With sweet clover they decided to try a few bees. The bees did so well that they bought more, and at the end of their third year with bees, sold a car of comb honey. At the time of my visit last July they had 135 acres of sweet clover on their own farms and the bees were working in the supers. The flow usually lasts from June until frost. The year before they had averaged 200 pounds of comb honey per colony.

E. I. Underwood, of Willow Lake, has been there many years, having come in as a homesteader in advance of the railroad. He is a beekeeper at heart having kept bees in the east in his boyhood. With the coming of sweet clover he took it up again, and now has an extensive apiary. G. Lathrop, at Aberdeen, established a nursery and secured a few bees. The bees have done well for him and as a result he is expanding his bee business rather than his nursery, with the promise that eventually he will devote his entire attention to the bees.

So it goes over the state. Wherever one finds a neighborhood where sweet clover is fully appreciated one also finds bees. In many places where no bees were present five years ago, there are now commercial apiaries and large scale honey production.

The Black Hills Region

In the Black Hills section, farming is confined to the rich valleys, but there is a much greater variety of nectar plants available. Because of the higher elevation there is more rainfall and a great variety of native vegetation. The hills are covered with trees, mostly pines, with a rich undergrowth of shrubs and plants.

There is practically a continuous honey-flow in this area from the time growth begins in spring until frost kills vegetation in fall. Beginning with the pasque flower and early willows, the bees can find nectar every day when the weather will permit them to fly. Dandelion is abundant and blooms until the first white Dutch clover blossoms appear. White Dutch alsike and alsike clover are abundant as well as sweet clover (melilotus) and alfalfa (lucerne) thus providing an abundant surplus pasturage. There are numerous native plants, such as vervain, catnip, Virginia creeper, wild cucumber, box elder, bearberry and gumweed, as well as heart'sease and goldenrod. Some of these plants are seldom visited by the bees because of the abundant sweet clover at the time they are blooming. The Black Hills region is probably the best beekeeping region in South Dakota and seldom excelled elsewhere.

In other sections of the state there is a much smaller variety of plants on which the bees can build up, and in neighborhoods where sweet clover and alfalfa are not grown, as already mentioned, there is little for the bees.

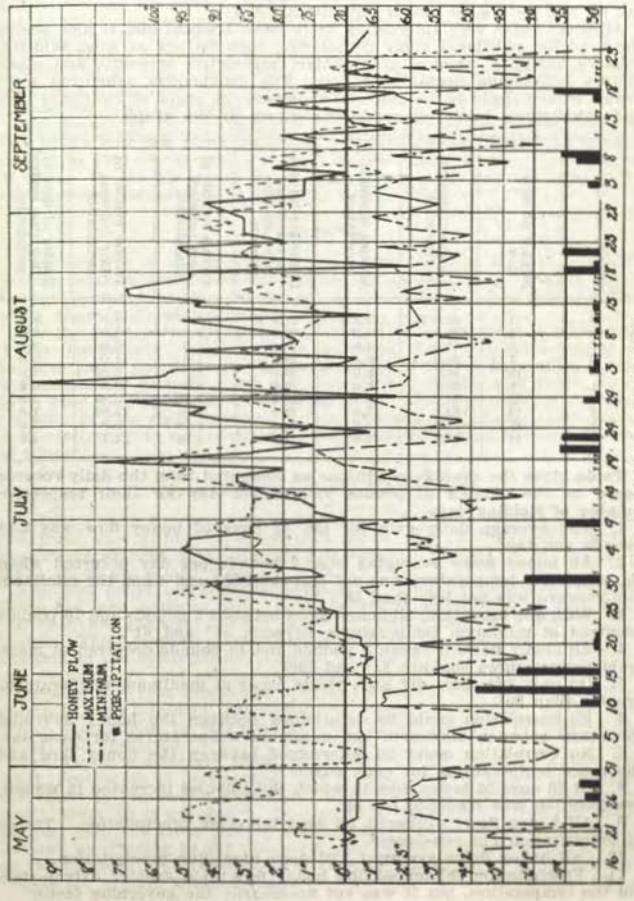
There are some very capable beekeepers in this region. E. W. Fox, of Fruitdale, had three cars of honey last year. There are several producers in the Belle Forche Valley who produce a carload or more of honey each year. I had heard much of the Blackwell Honey Company, at Rapid City, but was surprised to find a lady in charge. The men folks of the Blackwell family are engaged in other business, while Mrs. Blackwell and her daughter manage the bees, with some help during the busy season. Mrs. Blackwell started with a ten-dollar investment and sold 50,000 pounds of honey in 1925. Another good crop was in sight at the time of my visit.

Henry Behrens, of Hermosa, has the unusual combination of a cattle ranch and bee business. He is a naturalist who settled on the prairie in an early day. His collection of the birds and animals of the region is worth going far to see.

A STUDY OF A SOUTH DAKOTA HONEY FLOW

M. D. Farrar, Apiarist, Brookings, S. Dak.

During the season of 1926, I attempted to make a preliminary study of the conditions influencing the honey flow of South Dakota. The study is based on the honey production record of two average strength colonies in the College Apiary at Brookings. The two colonies were on the same scale and the weight changes divided by two (2) to secure the average daily changes for a typical colony. Daily weights were taken after the flight had ceased for the day. All weather records used were



Records of the season of 1926

based on the United States weather bureau record made at Brookings, South Dakota.

Previous to June 22, the weight records were approximately weekly averages and are not used in the final analysis. The honey flow considered lasted 92 days, beginning June 22, and ending September 22, as the first killing frost occurred on the night of September 23.

Traces of precipitation (amounts too small to record in the station gauge), marked on the graph by a small T, were not considered in calculating the precipitation factor. The exact hours of the day in which precipitation was recorded is not shown in the graph, and this factor explains conditions such as observed in August 22, showing a heavy rainfall as well as a good nectar flow the same day.

Although some very interesting facts were brought out, it also shows the need for additional study considering such factors as wind velocity, relative humidity, amount of sunshine, barometric pressure, and other factors influencing nectar secretion. The conclusions submitted were drawn from a study of the material shown on the graph of the honey flow and calculations based on conditions shown by the graph.

Pounds per day	Number of days flow	Average maximum temperature	Average minimum temperature	Differences between maximum and minimum temperature	Average number of days preceding precipitation	Average number of days following precipitation	Number of days of flow that received precipitation
10	1	82.0°F	61.0°F	21.0°F	2.0	1.0	0.0
8	1	100.0	71.0	29.0	2.0	3.0	0.0
7	3	84.6	59.0	25.6	1.6	2.6	0.0
6	1	98.0	60.0	38.8	1.0	1.0	0.0
5	12	84.0	58.0	26.0	2.0	3.36	1.0
4	7	83.1	59.2	23.9	2.1	3.4	0.0
3	12	90.0	60.7	29.3	3.58	3.83	1.0
2	12	80.8	58.0	22.8	4.0	2.83	1.0
1	17	77.7	54.2	23.5	3.58	0.9	7.0
0	14	74.6	49.8	24.8	4.64	1.7	4.0

Table gives the average conditions as computed from the daily records based on the number of pounds yielded per day for their respective number of yielding days.

1. The average daily gain for the 92 days of honey flow was 2.14 pounds per day.
2. All honey flows averaging over 2 pounds per day occurred when the maximum temperature was not less than 81° and when the minimum temperature was not less than 58°.
3. With one exception, all honey flows between 2 pounds and 10 pounds occurred at minimum temperatures between 58° and 61°.
4. All honey flows between 2 pounds and 10 pounds occurred at maximum temperatures between 81° and 100°.
5. On only two days did high yields occur at maximum temperatures greater than 90°.
6. No correlation could be determined between the honey flow and the range between maximum and minimum temperatures for each day.
7. No correlation could be determined between the honey flow and the mean temperatures for each day.
8. Of 80 days of honey flow in which the colonies increased in weight, precipitation was recorded for 14..
9. All honey flows averaged 2.6 days following precipitation. Traces of precipitation not considered.
10. All honey flows averaged 3.03 days preceding precipitation.
11. Precipitation influenced the honey flow to a greater extent than did the temperature, but it was not necessarily the governing factor.

BEEKEEPING CONDITIONS IN NORTH DAKOTA

By J. A. Munro, Fargo, North Dakota

One of the important conditions favoring development of any industry is the supply and availability of raw materials. So it is with the bee industry its development or growth, to a large extent, is dependent on the supply of nectar producing plants. The abundance of sweet clover and other honey plants in this state has led many to engage in the beekeeping business. In the majority of cases, the initial successes which crowned their efforts encouraged them to enlarge their apiaries. As a result of this, we have a number of beekeepers in this state, having one hundred colonies or more, who devote practically all their time to beekeeping. In this way, they have changed their beekeeping system from a sideline occupation to a specialized commercial venture. A few men, however, began beekeeping in this state on a sufficiently large scale that it required their full time as well as one or more assistants to care for their enterprise.

The growth of the bee industry in this state has been most remarkable in the past few years but it can still be considered as in the infancy stage. In 1920 the statistics showed North Dakota to have 708 colonies of bees. In the six years since then, beekeeping has developed into an organized industry of 28 times its size in 1920.

Wintering

The severity of the winters in this state and also lack of adequate shelter belts in many sections makes wintering a real problem either for the beginner or the experienced beekeepr who comes from another place where such conditions are different.

For the most part, wintering bees in cellars is practiced in this state. A few beekeepers, however, have wintered their bees successfully in packing cases out-of-doors. When bees are wintered in packing cases, it is necessary to have them well sheltered from the cold north winds by a good shelter-belt of trees. Due to the fact that most of the shelter-belts in this state consists mainly of trees which lose their leaves in the fall, they do not allow sufficient protection during the cold months of winter.

Type of Cellar Giving Best Results

Cellars giving the best results are those which are constructed below the frost line, either in a side hill or in well drained soil. Also a reasonable amount of ventilation and absence of light is necessary to make cellar conditions ideal.

The best cellar temperature to maintain is still a debatable question. Some bee men consider that a temperature of about 40°F. is best while the bees are indoors; others prefer a temperature of a few degrees higher. The accuracy of the thermometer or the height at which it is situated in the cellar probably would explain why it is that some prefer one temperature and others a different temperature. From a practical standpoint the best temperature is that which is conducive to comfort, quietness, and minimum expenditure of energy on the part of the bees. Wide fluctuations in temperatures should be avoided by having the cellar well insulated.

Ventilation is a feature about cellars which must not be overdone. Too much ventilation is detrimental if it is done at the expense of keeping the cellar in too cool a condition. Sufficient ventilation to remove the moist warm air is necessary. The air near the ceiling, being the warmest and also the most heavily laden with moisture should be removed through an opening in the ventilator shaft close to the ceiling. So long as the temperatures remain fairly constant at 40 to 45°F. the average ventilation system will take care of removing excess moisture. Damp-

Bee cellar of the North Dakota Agricultural Experiment Station

ness in the cellar or condensation of moisture occurs especially when there is wide fluctuation in temperatures. Moisture holding capacity of the air decreases as the temperatures decrease and therefore the excess moisture is rapidly removed from the air by condensation.

For a cellar having a capacity of about 150 colonies, one ventilator shaft of 8" diameter usually serves the purpose. Also an air intake should be provided and is often placed in the cellar door. The size of the intake may be regulated by a slide arrangement which can be opened or closed according to temperature requirements. Quite often it happens that towards spring the cellar becomes warm and the bees get restless before it is time for them to be moved out. When this happens it is often a good policy to leave the cellar door wide open at night and close it early in the morning. Keeping the door open at night allows the cellar to cool down and helps to restore quietness among the bees.

In order to insure an adequate supply of fresh air in the cellar at the time it is needed, the Smith Brothers of Amenia, North Dakota, use a system of forced ventilation in their bee cellar. Evidently their system is good, judging by their success in wintering bees. For example, during the past year, out of 180 colonies which they placed in the cellar in the fall of 1925, 178 came out alive in the spring. Their system calls for an electric fan placed in the ventilation shaft and it is operated according to the temperature requirements of the cellar.

So far very few beekeepers of this state have attributed their winter losses to the type of honey used for stores. Most of the honey produced in this state is from sweet clover or a mixture from clover and alfalfa. This honey has proven excellent for winter stores due to the low percentage of indigestible materials contained in it. Ordinarily a hive should have at least 35 pounds of honey when placed in winter quarters.

The time for placing bees indoors varies somewhat with the different sections of the state. This season, in the vicinity of Fargo, the best time for placing the bees in cellar quarters appeared to be the first week of November. In the northern part of the state, it would be a few days earlier and in the southern part a little later than this. Removal of bees to their summer stands is done about the first week of April.

However, this depends on the weather and also on the condition of the bees.

Spring Conditions

Due to the prevalence of high winds over a large portion of the state during springtime, it is considered advisable to have the bees in as sheltered a location as possible. Beekeepers living close to rivers or streams where woods are plentiful usually find it profitable to locate their colonies close to these woods, not only for the protection from the high winds but also for the nectar and pollen which the elms, maples, willows and fruit bloom yield.

Usually dandelion bloom proves to be a useful source of nectar and pollen. It is present in a large portion of the state. The honey from it, although rather unmarketable on account of its dark color and strong flavor, is valuable for brood-rearing and should be utilized for this purpose in so far as possible.

Later when sweet clover comes into bloom the colonies may be moved to the vicinity of sweet clover fields when necessary. Sweet clover has proven itself to be a very dependable nectar secreting plant in this state especially when grown on soils which have a fairly high moisture holding capacity. The beekeepers located where the lighter types of soil prevail, occasionally report sweet clover a partial failure as a honey plant. The light type of soil has a lower moisture holding capacity. The nectar yielding capacity of sweet clover grown on this light type of soil is greatly reduced during a period of drought, due to the fact that this type of soil cannot conserve the moisture for the plants. The past season's experience rather confirms this assertion.

In a section of the state where silty clay is the predominating type of soil, apiaries located in the vicinity of sweet clover fields produced an average of above 200 pounds per colony, while on the other hand, in a section about thirty miles to the west where silty loam was the predominating type of soil, the apiaries located in the midst of large acreages of sweet clover produced an average of less than 100 pounds per colony. A study of weather records was necessary here to determine the cause of sweet clover being a success in the one place and a partial failure in the other. The weather station located where the soil is silty clay showed for 1925 an annual precipitation of 21.32 inches rainfall, and 10.93 inches of rainfall for 1926 up to August 31. The other station located in the section where the soil is silty loam showed an annual precipitation of 22.17 inches rainfall for 1925 and 11.57 inches rainfall for 1926 up to August 31. There was not much difference between the rainfall of the two places, except that the lighter type of soil had a slightly larger amount of rain. A study of soil types shows that the heavier type of soil, silty clay, has a much better moisture holding capacity than the lighter type, silty loam. It would therefore appear that the sweet clover grown on a type of soil which has a good moisture holding capacity will yield nectar more abundantly than sweet clover grown on a type of soil which has a poorer moisture holding capacity. That is during seasons when rainfall is lighter than usual and fairly evenly distributed. It might be said here that there was no appreciable difference between the temperatures of the two places. There was, however, a difference of 19 feet in their elevation.

The problem of having bees build up to proper strength for the main honey flow concerns most beekeepers. In this state, there are many localities favored by early pollen and nectar sources and later by dandelion and fruit bloom which assist the bees greatly in reaching the peak. Swarming is one of the things which is liable to be very prevalent if the hives are not supplied with adequate room for brood rearing and other needs. Keeping each hive supplied with a young queen is also a factor in reducing the amount of swarming, but unless adequate room is supplied when it is needed, almost any colony of bees will swarm. In localities where conditions sometimes prevent the bees taking advan-

tage of fruit bloom, dandelion or other spring sources of nectar and pollen, it is necessary to feed the colonies with sugar syrup, that is if they are liable to run short of honey for brood-rearing. The pollen shortage might well be supplied by pollen combs saved over from the previous year, especially if the pollen is covered with capped honey. The capped honey over the pollen serves to keep it moist and fit for the bees.

Although American Foulbrood is not as yet a problem of major importance to beekeepers of this state, it may in time become a serious drawback to the industry. The apiary inspection service during the past two seasons revealed a number of cases of American Foulbrood, all of which infected hives were burned under the direction of the inspector who made the inspection. It is but natural to expect that new cases will develop from time to time and it is the policy of the inspection service to locate these and do everything possible to keep the disease under control.

EFFICIENCY IN HONEY PRODUCTION

F. Jager, University Farm, St. Paul

It takes three favorable factors to obtain the maximum possible amount of honey; the bees, the location and the man.

In bees both the quantity and quality must be considered. Neither a large apiary of poor bees nor a small apiary of good bees will produce the maximum but a large apiary of good bees will, assuming that the second and third factors are present.

A man may keep from 200 colonies of bees without help. If he has to hire an assistant he should double that number. He will obtain the same result without help by doubling the efficiency of his bees.

After all it is the quality of bees that count most in successful beekeeping. Bees differ in industry and honey making habits; the same colony may act differently at different seasons. Colonies also differ in relative strength, in hardiness, in speed of flight, in longevity, in swarming, and in brood-rearing in and out of season.

Home, apiary and cellar of F. Jager, Saint Bonifacius, Minnesota

The man who produces comb honey will know that bees differ, also in capping of honey, burr comb building, propolizing, etc. Again, what may be a good quality of bees for a man in one location may not be as good for another man under different conditions elsewhere.

Quality, therefore, is a relative term which after all every beekeeper must determine for himself. The queen bee is directly responsible for the quality of bees, and the question of quality resolves itself into the quality of queens a beekeeper has in his beeyard.

There are some general characteristics which are common to all quality queens. They should be young, prolific, pure bred as to race, and descendants of the best honey producers in the yard.

Then there are individual requirements especially for a particular phase of beekeeping. Such are—hardiness in the far north, cellbuilding for queen breeders, burr combs, white capping and propolizing for comb honey producers. Comb honey queens are soon bound to become a special breed.

It is probable, therefore, that the professional beekeeper of the future will not buy his queens at random no matter how well bred these queens may be. He will be forced to be a queen breeder himself, or have some professional breeder raise queens for him—personal queens from breeders selected by him.

Take a comb honey producer, he will raise his own comb honey queens. His bees will not build burr combs between the wood and the sections, they will cap the honey neither perfectly smooth nor very rough—both ways make comb honey less attractive to looks than a certain artistic finish hard to describe. They will cap sections snow white; they will not mar sections with propolis. Breeding from such queens for years will fix these comb honey characteristics in bees. The beekeeper will then be able to produce such comb honey as his trade demands and will not be forced to take chances as he does now.

The question of economics also comes here into play. To run a large number of colonies requires a large overhead expense. May not better results be obtained with fewer colonies and better quality queens, and at a much reduced cost, enabling the beekeeper to sell at a profit, when his less wise brother beekeeper sells at a loss?

A SUMMARY OF BEEKEEPING IN ALABAMA FOR 1926

W. A. Ruffin, Auburn, Alabama

Alabama claims the distinction of producing more queens and package bees within a radius of fifty miles of Montgomery, the capital city of the state, than any other like area in the world. Queens produced in Alabama are sold in most of the States and Provinces of North America. These sales are growing each year as is shown by figures taken from the reports of the State Apiary Inspector as follows:

Year	Queens Sold	Packages Sold
1924	136,000	18,000
1925	180,000	30,000
1926	190,000	40,000

The seasons in Alabama are such that the shipping season coincides with the time that queens and packages are needed in the northern states to replace those lost during the winter and in time to make seasonal increase. The figures given above surely speak well for Alabama bees and as for the beekeepers themselves, they are honest, modern in their methods, and dependable.

There is very little disease found in this state. The apiary inspector and his work is supported by rigid regulations and quarantine. Foulbrood is burned wherever it is found. The colonies infected with Foulbrood in this state at present are less than one-fourth of one per cent.

Year	Colonies Inspected	Diseased Colonies
1924	20,000	125
1925	24,000	105
1926	25,000	35

The honey crop in Alabama this year was spotted. In the gallberry and titi regions a yield of 400 pounds was reported from some colonies. In other localities the yield was fair and in others there was very little surplus stored. The local demand for honey was fair with medium prices prevailing.

THE PLACE OF THE DEMONSTRATION APIARY IN EXTENSION WORK

George H. Rea, Ithaca, New York

When apiary extension work began, it was conducted along the general lines followed by all extension activities at that time. It was a war measure intended to stimulate honey production and at the same time

Demonstration apiary of C. C. Hamot, Waterford, Penn.

discover the main Beekeeping problems and assist the beekeepers in solving these problems. Because it was impossible to visit each individual beekeeper the best method was to call them together in groups and discuss beekeeping problems and as far as possible demonstrate methods of management. The activities were along the line of general demonstration meetings, field meetings and picnics, beekeeping tours and inside meetings. The place of meeting and local advertising was done by the county agent as far as possible. In the absence of a county agent or lack of co-operation on his part this work was sometimes done by the secretary of the county beekeepers' association or some interested beekeeper. In connection with the group meeting as many apiary visits as possible were made in that locality in the limited time before and after the meeting. Because it was a new thing in the community and the possibilities that were apparent in the way of improving beekeeping practice, bettering honey market conditions and co-operative purchase of beekeeping supplies, many local and state beekeepers' associations were rapidly organized. After the war was over and honey prices dropped and the bee supply companies reduced the discounts to beekeepers associations a stimulus for keeping up attendance in the association seemed to be lacking and the membership rapidly dropped off. It then became necessary for the extension specialist in beekeeping to devise some means to keep up the interest of the beekeepers in their problem and to help the associations.

When I resumed the work in Pennsylvania I found that Professor N. E. Phillips had a series of demonstration apiaries going in the state that were doing effective work. Since that time other apiaries in other counties have been taken on until this fall there are thirty apiaries scattered about the state and located so that practically every different beekeeping section of the state has a demonstration apiary.

The plan in establishing a demonstration apiary is to first find a beekeeper or one who is about to start in beekeeping who is willing to co-operate to the extent of working the bees by methods advised by the specialist. The beekeeper owns the apiary and supplies everything that is needed in the way of equipment, does all of the work and of course benefits by all of the results obtained. The specialist agrees to make as many visits as necessary to the apiary to teach the methods of management and while there he usually works the colonies and makes a check on the condition of each colony and advises regarding the work to be done until the time of his next visit. In the case of a beginner it is necessary to visit the apiary about every month or six weeks while if the beekeeper has had some experience three or four visits during the summer is all that is necessary.

The work is always done in co-operation with the county agent and the local beekeepers' association. Ahead of each visit the county agent sends out notices to all beekeepers in his county that the beekeeping specialist will visit the demonstration apiary on a certain date and that a demonstration will be given on certain phases of beekeeping. All are welcome whether they are members of the association or not. Each visit then becomes a seasonal demonstration meeting. All who are interested come and are asked to assist in working the bees and while this is going on a rapid run of questions and answers and instructions is kept up. In many instances beekeepers have formed the habit of calling at the demonstration apiary between meetings for the purpose of finding out how matters are going and to obtain additional information from the owner. The rule is not to take on an apiary that is already well managed. A well managed apiary is already a good exmple in that community and it is more effective to find a good co-operator in a community where beekeeping methods are poor while beekeeping possibilities are at least fairly good.

In every case the owner must agree to do exactly as instructed, excepting that if the specialist succeeds in properly training the man he will vary his operations to meet the needs of the case. Because of the many factors that influence bee behavior and the necessity of the beekeeper to be able to vary his operations accordingly makes it exceedingly hard, in fact, almost impossible, to give a beginner exact instructions about what to do for any length of time ahead. The owner then must be one who is willing to study bee behavior and who has sufficient ability to apply what he has learned. Not all of the demonstration apiaries are equally successful, largely because of the human factor that enters into it. In fact, some of them have been flat failures and have been given up after keeping them for one year. Most of them have been very successful and have fully justified the time and expense. Last spring every one of them stood out in the community as examples of good wintering, with one exception that will be mentioned later.

In the state of Pennsylvania something like seventy-five per cent of the farmers' bees died, last winter and spring. Since it is a state of small beekeeping this means that perhaps more than fifty per cent of all of the bees were lost. The cause was lack of proper protection in a winter that was unusually severe coupled with bad stores. Honey dew was stored in most of the state and fall honey in all of it and those

Meeting at D. A. Woods' apiary, Alexandria, Penn.

who failed to feed sugar as a food corrective and failed to protect the bees from freezing lost most of them. In the same communities where most of the bees died the demonstration apiaries were in fine condition and the honey production this summer was far above that produced in the neglected apiaries and in some cases this was the first honey crop of any account produced in the locality. The exception mentioned above was one apiary where the bees were not fed sugar, last fall, because of a mistake in the instructions and in spite of good packing cases the colonies were all dead this spring.

For the whole state the methods of management are uniform and varied only as regarding the time of the honey flows. The bees in the demonstration apiaries are wintered in dual or quadruple packing cases, with one exception where they were put into a cellar. The food chamber hive is the standard, using two ten framed hive bodies for winter and spring breeding. The bees are packed before hard freezing takes place. The upper story containing ten frames full of honey and the lower story ten empty combs. This arrangement is too well known to need discussion here. The packing is left on until danger of killing frost is over in the spring. Annual requeening, simple methods of queen rearing, swarm control, disease control, are a few of the many things that are demonstrated as the season progresses.

After the honey crop is harvested the beekeeper is taught how to put it up in attractive form for market and methods of marketing are discussed with him and in public meetings of the beekeepers of that community. In the short time that these demonstration apiaries have been conducted they have proven their undoubted worth in the decided improvement of beekeeping conditions in the particular communities where they are located. Contrary to the supposition of some that such demonstration work would stimulate a lot of persons to keep bees and thus add to the already too large a number of small beekeepers, this is not the case. In fact, quite the opposite thing happens. Many, who do not care to go to the expense and work involved in modern beekeeping and yet do not want their poorly kept apiary to be a menace to good beekeeping, are willing to be bought out by some one who will give the bees proper care. Others learn the lessons taught in the demonstration apiary and rapidly adopt the modern methods. The result is that, in two or

three years, there are less beekeepers but better beekeepers in that community. The colony average of honey production is increased but the honey is put into the market in better shape and better co-operation in grading and prices is found among the beekeepers.

BEEKEEPERS' ORGANIZATIONS IN EUROPE

E. F. Phillips, Ithaca, New York

American beekeepers frequently discuss the needs of organization and it is generally recognized that we are far from being in a healthy condition in that regard on this side. Statements frequently come to us about wonderful societies of beekeepers across the water, and we often wonder how they have solved the problem of getting co-operative action among such large numbers. The short trip which Mrs. Phillips and I took in a few countries of Europe last summer was quite too brief to enable one to arrive at a complete answer to this question, but naturally this was one of the things which especially interested me, since I am one of the many on this side who believe in organizations. It is impossible fully to outline what the societies of beekeepers across the water are doing, but perhaps it can be indicated briefly and perhaps from what is said some idea can be formed of the way wherein their methods are unlike ours.

German Switzerland has a society numbering 18,000 beekeepers, in an area equal to about four moderate sized New York or Iowa counties. French Switzerland is organized with about the same proficiency. Practically every department (the political unit) in France has a good society. In England and Scotland there are strong organizations of the beekeepers of the entire countries, and they have countries, shires and even much smaller districts well organized. In many cases the local societies are closely affiliated with the societies covering a larger territory. These are the countries visited, but in these countries the beekeepers are looking with envy on Germany with its federation said to number 180,000 beekeepers. Austria is thoroughly organized and tremendous societies are found in other parts of the continent of Europe. This condition might be compared with that in the United States, with a national organization which can muster annually only a few dozen beekeepers at the meetings. None of our state societies can compare in size or influence with the great societies abroad.

One exceedingly important factor in the success of the foreign societies of beekeepers is that practically every one has an official organ in the form of a good beekeeping journal which goes monthly, in England weekly, to every member. Because the bee-journals abroad are thus liberally supported by the societies, their influence and their contents on the whole surpass those of the journals published in this country.

The cost of publishing such journals is an important consideration, and whenever such a plan is suggested over here, this is the first thing mentioned. Perhaps printing costs are relatively higher here than in Europe, for it is no secret that not more than two of the journals published in the United States are now published at a profit. There is not sufficient difference in printing costs or in subscription prices in the two continents to make as much difference in the number of subscriptions as exists, however, and it is worth while seriously to consider the benefits of such organs to societies and of such societies to the papers. Official organs have been tried to only a limited degree on this side, but wherever tried they have been somewhat successful.

When a society undertakes to publish an official organ, the duty then falls on both officers and members to procure support in the form of members to the organization and thereby subscribers to the journal. The getting of additional members thus becomes a necessity, and this results in just what we have always thought necessary over here, an increase

in the memberships, and strength of our societies. Since the journal is the primary motive for increasing memberships, efforts are made to obtain as members only those persons who are readers, well educated and cultured people, who will gladly support a journal which brings to them things which are an actual benefit. The non-reader, or the man who does not care to study his bees or the literature regarding them, is not wanted in one of the societies which is supporting an official organ. The man who refuses to study or who takes no interest in advancement through reading is, however, a poor beekeeper in this or any other country. It would not be a bad plan to discourage the shiftless or negligent beekeeper on this side, and this is indirectly accomplished by the publication of official organs by the societies. Members can easily be urged through the journal to buy up the bees owned by those who belong to the class of those who do not care to read a bee journal, and whether or not this is a definite plan on the part of the strong European Societies, this is just what has resulted from their plan of organization. The benefits of an official organ to beekeeping are therefore far reaching and there is brought about just the situation in beekeepers' organization for which we have all so long wished.

It has not been the plan in the United States for the societies generally to publish their own organs. We often hear it said that we already have too many journals, whereas we have less than any other country on the basis of the scope of the beekeeping industry. Some of our journals are inadequately supported and are therefore weak in their influence and often poor in their contents. It takes subscribers to get out a good journal. We do not have too many journals now, but we fail to subscribe for the good ones. The total number of persons in the United States who subscribe for a bee-journal probably does not exceed, a lamentable situation as compared with conditions in Europe. There are extensive beekeepers, men owning and managing bees running into the hundreds or even thousands, who do not now take one of the bee-journals. One one occasion in the west I visited a beekeeper who operated at that time nearly a thousand colonies. There were some disease in his yards about which he asked my advice, and since it was impossible for me to remain with him for more than a few minutes, I suggested that he find the descriptions of symptoms and methods of treatment in some of his books or bulletins or in one of the journals, so that he could study them after I had left. He confessed somewhat reluctantly that he did not have a single page of printed matter on bees and that he had never had any. Most beekeepers will agree that the sooner such a man drops out of beekeeping the better for himself and especially the better for beekeeping.

A few of the state organizations in this country have attempted to publish their own official organs, and in every case the society seems to have been made stronger through the effort. The results have not been comparable, however, to those in Europe, and probably this is due to the character of the official organs published. Usually they are devoted chiefly to the affairs of the society and discuss purely local affairs, so that they are not of interest to those outside the state, and in fact, are not interesting to most beekeepers. They always avoided competition with the regular bee-journals, and have therefore not been papers which gave the subscribers fundamental and broad information in sound and practical beekeeping. The European journal published by the societies place no such limitations on themselves and each journal carries articles which cover the whole field. Only a small part is devoted to association affairs, which after all are merely the machinery of progress, not progress itself.

The first reaction of the existing journals might be that such competition would destroy them if carried far, but I am under the impression that our good journals would be far better if they had some real competition. I do not know that it is best to have all journals published by societies, but this is the sort of question which will settle itself through natural courses in time, and I can see no fundamental danger to the societies or to the beekeeping industry in the publication of strong official organs by most of our organizations. The officers of the League will perhaps reply that they have tried to publish a small organ for the information of the members and that it has not had the favorable result which they hoped for.

The obvious answer is that the League Bulletin never gives information on beekeeping, but is devoted solely to plans for enlisting the support of beekeepers in the League. Too often their plans have been those in which the beekeepers are not even remotely interested. There can be no strong official organ unless it is conducted on a policy which will interest the beekeeper, and the machinery of organization is a dull subject to almost everybody.

Certainly it will be admitted that the organizations of American Beekeepers could scarcely be in poorer condition than they are now. Any plan to improve this situation is worthy of consideration, and the plan of issuing official organs is even worth a trial. If it accomplishes a third of what it has done in Europe, it would revolutionize American beekeeping.

HONEY AND EVOLUTION

By E. R. Root, Medina, Ohio

To the casual observer the subjects of honey and evolution are so widely separated that there can be no possible connection; but to one who has an open mind, a believer in the records, as taught by the rocks and the hills, there is a very intimate relation, a relationship that I think will show that honey ought to be a much more prominent article of diet upon our tables than it is.

The per capita consumption of honey in this country is variously estimated from one and one-half to three pounds, while the consumption of cane sugar—or, more exactly, granulated sugar from beet or cane, has a per capita consumption of from a hundred and two pounds to one hundred and forty-eight pounds. Let us take the lower figure. On that basis there would be approximately fifty times as much cane sugar consumed as of honey. This seems to be more than the human digestive tract can stand without damage. There are not wanting facts to show that there are certain diseases of civilization, diseases that our forefathers did not have and that the savages of the present day do not know. The reason for this is due largely to the over-consumption today of starches and sugars of the refined sort.

Down thru the ages or aeons of time changes have been taking place. It is only within the last one hundred years, or even less, that refined cane or beet sugar has been known. Prior to that time with the exception of a little unrefined cane sugar the sugars that man had were those supplied by nature. These came from the sugars in fruit and from honey. Authorities tell us that most of the sugars in fruits are the same as the sugars in honey. Sugars in fruits are greatly diluted with water and cellulose, or roughage, as we sometimes call it. Honey is the only concentrated form of sweet that nature supplies. Man can eat these without harm.

Bees, animals and mankind have been subject to the laws of evolution, gradually changing. Man has been coming down the ages and along with him the natural sugars and the grains. During these ages or aeons of time man's digestive apparatus has become accustomed to the natural sugars, and those natural sugars in the great majority of cases are levulose and dextrose, the two sugars found in honey. In a few cases we find dextrose the main sugar in the fruits; but nature seems to provide in most cases that there shall be a balance of the two sugars in honey in nearly equal proportions, levulose and dextrose.

Authorities tell us that honey, or the sugars in most fruits, are absorbed into the blood directly and without change. Cane sugar, an artificial sugar, must be changed by the digestive fluids in the human stomach into levulose and dextrose before it can be absorbed. While it is admitted that a healthy man or a healthy individual can eat cane sugar without harm, it is apparent that civilized man, or one of indoor life, is not a healthy individual, as a rule. It follows, then, if he can have in the way of food the whole grain, including husks in the form of bran, certain minerals, gluten and starch, and if he can have those sugars that nature originally gave him, as found in fruits and in honey, he will be healthier and stronger in every way. But civilization has decreed otherwise. It has forced on to man over-refined starches and sugars. In both cases the vitamins and mineral elements so necessary to his very life and being, have been eliminated, with the result that we are having diseases of civilization that were not found a hundred or two hundred years ago. In a word, we cannot change our digestive apparatus in a hundred years, an apparatus that was in the making perhaps millions and billions of years. If we give our digestive tracts the foods that nature provided for us during those millions of years, we will live happier and better. It is for this reason that I am an advocate of natural foods, particularly of honey, the only concentrated sweet that the great Creator ever gave us. I not only advocate these foods, but use them in my home. White sugar and white flour have been eliminated.

I may be stirring up a hornet's nest among some of the old Fundamentalists. But let me tell those good people that I believe in the story of the rocks and in the hills, a story that is accurate and infallible. I believe also in revealed religion and not necessarily of science as found in the Bible. I am a believer in evolution and I am a believer in the Bible, especially in the life and words of Jesus Christ, the greatest man that ever trod this earth, a man who has done more to elevate his fellow beings into a higher type of thinking and living than any man that ever lived. He is nearly all religious. He is the essential part of a civilization, if successful.

WHERE ARE WE DRIFTING?

John G. Jessup, Council Bluffs, Iowa

Many times during the last few months we have been asked, "Why is the wholesale price of honey this year (1926) less than last?" Official reports all indicate that the honey crop, in the majority of honey producing sections of the United States was less than last year. But in spite of this the average price being paid for western honey in carload lots is probably at least one cent per pound less than a year ago.

Several things may have contributed to this drop in price and it is difficult to say just what is the direct cause. There was a small carryover of the 1925 crop which was not cleaned up before the new crop was ready for market. The old crop was offered at a low price in order to make room for the new, and the price paid for the old, established a possible price for the new crop. Then California and Texas came into the market early with a large crop offered at a price of 5¾c to 6½c. True, this honey was not equal to the water white honey of other regions, but it took the place of honey that would otherwise have been supplied from sections with higher priced and finer quality honey. Those who had carried the 1925 crop over with the hope of securing a better price, had sold it at a heavy loss and therefore were anxious to dispose of the new crop without delay and avoid any possible chance of further reduction in price. All had been watching the held honey, and seeing it sold at a loss, all were inclined to sell early. These combined factors may have been largely responsible for the reduction, but still another factor, "Consumers' Demand," may have also had a depressing effect.

It is a regrettable fact that we have no statistics that will enable us to determine what our industry is doing. The government census report includes only bees and honey produced on farms, which is probably only one-third or one-fourth of the total. Practically all of those who produce honey in car-load lots, do not live on the farm. Also there are many small beekeepers located in towns and cities, who produce in the aggregate a large amount of honey. Therefore, the census figures cited by some as authoritative are of little value. The census for the United States gives the total annual production of honey with the per capita production as follows:

Census Report	U. S. Crop	Per Capita Production
1900	61,099,290 pounds	.84 pounds
1910	58,814,890 pounds	.59 pounds
1920	55,224,061 pounds	.52 pounds

In fact it is almost certain that the total crop of honey produced has not decreased. The increase in the number of commercial and urban beekeepers has certainly been sufficient to maintain the annual production and it has probably increased a great deal more than enough to keep the per capita consumption equal to what it was thirty years ago, taking into consideration the increased population of the country.

The census report gives the following information in regard to Iowa beekeeping:

Census Report	Farm Reporting Bees	Total Colonies on Farms	Pounds of Honey Produced
1900	28,977	138,811	.....
1910	28,935	160,025	2,374,080
1920	18,280	133,319	2,840,025

Average No. of Colonies Per Beekeeper	Percent of Farmers Keeping Bees	Colonies per Square Mile
4.8		
5.5		
7.6	82	2.7

The rapid decrease in beekeeping on the farms from 1910-1920 is no doubt due to the inroads of American foul brood. The effect being a great reduction in those keeping bees, 10,655, and an increasing in the colonies per beekeeper, although the number of colonies was reduced. It is also of interest to note that the total amount of honey produced in 1920 was greater than in 1910, although the number of colonies was materially less. This would indicate an improvement in the standard of beekeeping. If we had records showing the honey produced by those living in towns and villages the total production and number of beekeepers would be greatly increased. It is safe to estimate that Iowa today has an annual crop of eighteen million pounds of honey, worth well over five million dollars to the state of Iowa.

We are proud of this great crop, but we must face the facts that the price offered, at least for extracted honey in the wholesale markets, is 10 to 15 percent less than during the past two years. Some improvements in beekeeping equipment have been offered during recent years, such as non-sag foundation, and extractors of greater capacity. But these certainly have not cut the cost of production to any great degree. Nothing has developed that reduces the cost of production an amount equal to the reduction in price. Therefore, if the beekeeper is to make a normal profit, one of two things must be accomplished, either the cost of production must be reduced or the price stabalized.

We are all producing honey by the most economical methods known, as far as the individual is concerned. One cost of production in most localities is that of fighting American foul brood. The individual is powerless to prevent reinfection of this disease year after year, but the state with adequate appropriation could do a great deal to reduce the amount of infection or eliminate it entirely.

We appreciate the $1,500.00 annual appropriation wihch we have to take care of four brood, but why should Iowa, one of the leading honey producing states, have such an inadequate appropriation? It is not enough to begin to do efficient work. We should have ten times this amount. An amount at least equal to that being devoted to this work by other states; Illinois, with $16,500.00, Wyoming $12,500.00, Wisconsin and Michigan, $12,000.00. Urge your county representative to see that the beekeepers are given an appropriation, at the next legislative assembly, that their five million dollar industry is worthy of.

Let us not overlook the possibilities of our association improving the market for honey. The majority of the honey crop of Iowa is consumed within her borders, which fact gives us a real opportunity to develop our market to the fullest extent. The 1925 Iowa year book of agriculture reports the price of extracted honey ranging from 10c per pound in some counties to 25c in others. Comb Honey prices ranging from 13c to 28c. What a need for stabilization of price and equal distribution of the crop! Not only does the man who sells to the trade direct need this help, but the carload producer as well. The carload price of honey is being affected by the small producer who is shipping in small lots to the bottler. In the aggregate, these small shipments amount to many carloads. One Iowa bottling concern has received small shipments this year totalling over ten carloads. For this reason the large producer is as vitally interested in seeing the small man market his entire crop at a good figure direct to the trade as is the small producer himself. If this was done it would tend to increase the price paid for carload lots.

The association can do a great deal for the marketing of honey without going into the bottling business, which would of course be impracticable. Today honey must be sold in competition with widely advertised syrups and jellies. Effective advertising material could be originated and distributed by the association. The association could maintain a honey exchange, securing honey for beekeepers who are sold out from those who are over stocked. All should be urged to buy honey to supply their trade when their own crop is exhausted. And above all, every one should be impressed with the difference between the wholesale and retail price of honey. It would no doubt be advisable to develop a state label with rules and regulations which must be followed in putting up the honey by those who use the label.

All who could use such service should make it known, because only where there is a place for such work, can it develop.

It is reasonable to believe that a marketing campaign would result in an average increase in the price of honey over the state. Assuming that it would be possible to raise the average price only one cent per pound, it would mean a direct increased return to the beekeeper of $50,000.00. That's worth some effort. No time should be lost in getting the work started.

Let the beekeepers of Iowa pledge themselves to greater activity in eradicating American foul brood and more profitable marketing of their crop.

OUR DUTY TO THE PUBLIC

R. H. Kelty, East Lansing, Michigan

The present social structure necessitates close inter-relationships. Modern development of communication and transportation has so greatly reduced the barrier of space that the West, the North, the South, the East have lost their definition.

The nature of our relations with others determines our reputation, and we, as beekeepers, will do well to pause a moment to consider what the public really thinks of us. If there are still large numbers of people who think of beekeepers as stooped old men with flowing whiskers and a cane, who spend all their time fussing with a few hives of bees, then

we should lose no time in telling the world how we go about the production of Nature's sweet.

What is our duty to the public? Considered from a broad viewpoint, we might say, "The production of the best possible quality of honey as economically as possible." And in consideration of the present status of the honey market, we might well add, "And see that the honey is efficiently marketed."

In a recent talk to beekeepers, Professor J. T. Horner, of the Department of Agricultural Economics, Michigan State College, stated the case as follows:

"The problem of every business today, regardless of its nature, is that of selling. There would be little difficulty in securing a profit if the productive problems were the only ones with which the business man is confronted. Productive methods have improved so much because of the aid of science in the last hundred years that it is relatively easy to produce goods. The big job is to sell these at a price that will return a profit. However, it must not be forgotten that strict attention must be given to the productive processes. It is not so easy to produce goods at a cost which will leave a profit; therefore, a business will not be profitable unless strict attention is given to the problems of production as well as those of selling."

The average beekeeper's attention has been devoted to production problems almost exclusively. And there is room for still greater development along this line. For, unless something can be done to raise the retail price for honey, profit in beekeeping must be derived from economy in production. This is in keeping with the trend of affairs in other agricultural lines. The dairyman is urged to produce more milk, not by increasing his herd, but by improving the production of his present number of cows.

Applied to beekeeping, this means the adoption of systems of management which will enable the beekeeper to produce larger average crops from the same number of colonies. Our successful commercial beekeepers already have this faculty developed to a high degree. And they are continually seeking improvements in practice and short cuts in manipulation.

But our beekeeping literature is full of production problems. To stabilize our industry, we beekeepers must lend the same zeal to a study of our marketing problems that we have in the past lent to bee behavior. To quote Professor Horner again:

"I do not believe that we know enough about the honey market more than to make generalizations. A real study of this market is needed. Facts should be substituted for preconceived ideas and misconceptions. Do people like honey? What is the actual per capita consumption of it? Why isn't more used? Is it used as a luxury, or as a regular item in the diet How much more would be used if the price decreased? How much less would be used if the price doubled? Why is honey used? Is it because people like it—think it is good for them, cheap, easily secured, advertised,—or why? What would induce people to use more honey? What determines the price of honey (a) the price the consumer is willing to pay, or (b) the price the producer is willing to take, or (c) is the price set by wholesaler and retailer, or (d) is it set by custom, or something else?

Through what channels does honey pass on the way to the consumer? Is it feasible to sell at roadside markets, from house to house, mail order, to retailers, to wholesalers, or how?

I recommend a thorough study of the honey market with particular emphasis placed upon consumer demand. The man who knows demand holds the key to a profitable market. What do the honey producers know about their market?

Let us repeat the last question, "What do the honey producers know about their market?" For the most of us, the answer would be brief. The majority of beekeepers feel that when the honey is in cases ready

for shipment, their part is finished. But pick out the ten most prosperous beekeepers of your acquaintance. Are they not, invariably, good salesmen for honey? Do they not try hard to sell their crop at better than average prices? Isn't it true that they have spent much effort year after year, building up a trade for their honey?

The crying need of the beekeeping industry today is the development of the selling capacity of the beekeepers. For is it not true that, with the exception of areas of heavy production or thin population, if the possible demand were fully developed it would be unnecessary for the bulk of the honey crop to move more than one hundred miles?

Now, before any good salesman goes out to sell any product he wants to know all about it,—its goodness, usefulness, superior qualities as compared with other articles already in use, who it will appeal to,—children or grown-ups or both, whether its sale will be seasonal or steady, how well it keeps, and finally, whether it is a product which he can stand behind with a flat guarantee of service.

One of the oldest distributors of grocery lines, who have been in business for seventy years, have, during the past year, based their advertising appeal on children's stories. Their "Teenie Weenie" full page ads have appeared in the Saturday Evening Post, Ladies' Home Journal and other magazines of wide circulation. When a house of such standing finds it profitable to appeal to children is it not reasonable to suppose that beekeepers might profit likewise?

A local grocer, a Hollander, who likes flowers,—and children, a few years ago started a little grocery in the outskirts of town. His flowers bloomed brightly and his business prospered, so much so that he moved into a larger store. His business continued to grow, and one day the writer asked him what particular form of advertising gave him the best results. His reply was interesting. He said that periodically he mailed several hundred post cards to his customers, saying that if the children would present the card at his counter he would have a present for them. These presents were very inexpensive, but the gifts were looked forward to with much anticipation. Child appeal has built up his business.

We beekeepers know a lot about bees, but we are lacking in knowledge of honey. We should know more about its handling, its storage,—for to say that all honey will keep indefinitely in storage is incorrect, and most important of all, we should know the housewife's common objections to honey:

(1) Stickiness. Many people do not know the trick of removing extracted honey from a serving dish without getting the fingers, the serving dish and the table cloth sticky. And the particular hostess is not likely to take a chance on embarassing a guest with such difficulties. It would be a distinct help if a fool-proof honey dish could be invented.

(2) Expensive. How often we hear someone say, "Yes, we like honey, but it is so expensive." Whenever a beekeeper hears this expression he should explain that a pound of honey will spread as many slices of bread as a pound of butter at half the cost. He should also explain the advantage of purchasing the larger packages.

(3) Too intensely sweet. Many folks say, "Honey is good, but it is too filling." There is no reason to doubt that many would eat twice as much honey at each sitting if it were not intensely sweet. This objection can be met by suggesting that the housewife dilute the honey for one serving with one-fifth water, making a syrup for hot cakes or waffles.

(4) Crystallization. Beekeepers expect honey to crystallize, but there are relatively few in the consuming public who understand the reaction. We should always explain the physics of the case by saying that honey, like other super-saturated solutions tends to become solid after standing for awhile. Furthermore, if it is intended that the honey should reach the customer in the liquid form, the honey should be heat-treated before packing. Otherwise, directions for liquifying should be printed on the label.

It is possible that much good would be accomplished by a study of the buying habits of the American housewife. We hear often that small packages are undesirable. Yet, if the city housewife wishes to buy small packages of honey, even though the honey is more expensive in that form, should we refuse to cater to that trade?

One of our advanced students who had specialized in beekeeping and poultry raising, spent several months working in various stores of the leading Chain in the country to get the customers' viewpoint on purchases. Really, he was studying customer demand. His comments follow:

"The American housewife seems to be subject to two conflicting emotions upon entering a store to trade, namely, economy versus quality. These two forces work against each other, but usually quality has the better of the argument. Assuming that quality is possible, she then wants something that is:

(1) Cheap, for industrial areas the standard of living is such that outlay for food must be curtailed.

(2) Sweet. There is much greater demand for sweet things such as jams, preserves, jellies, etc., for instance dill pickles sell slowly, while sweet pickles move rapidly.

(3) Convenient, easy to open and to use. Something that does not require much preparation before using. For instance, although sandwich spreads are expensive and are not pushed in a sales way, they find ready sales for lunches and dinner pails.

(4) Small. Although small packages represent poor economy they are far the better seller. In industrial centers, families and kitchens are small and the housewife does not wish to have large packages standing around. In fact, it seems as though she buys just enough for one meal at a time. For instance, in the case of a leading brand of beans, the 9c size sold rapidly, while the 15c size, which was nearly three times as large, sold slowly. The same was true of mayonnaise and even washing powders.

This student went on to say that it appeared to him as though it would be suicide to push the sale of five pound pails of honey in Chain stores. Rather, the package should be smaller, preferably glass. Also, a sales "pusher" should be used, the logical one being comb honey. This policy, combined with frequent visits to the store to see that the honey is kept on the counter, should get results in his opinion.

These conclusions would not apply to agricultural districts. For it was the student's observation that when farmers came to buy, they purchased larger packages and in larger quantities than the city folks.

These suggestions are not offered as conclusive evidence, but obviously there is a weak spot in our present methods of selling honey through groceries, and suggestions for improvement are in order.

Modern sales policy must include the use of advertising in some form. Big business uses the display type of ad in newspapers and magazines, to produce good will, to increase the volume of business and to lower the actual sales cost. But it is not wise to spend large sums of money on advertising unless the distribution and quality of the product are guaranteed. The volume of business done by some of the large manufacturers is so great that their enormous expenditure for advertising represents but from 2% to 6% of the total business done.

If beekeepers were to spend a similar proportion for advertising, it would be necessary to raise nearly half a million dollars yearly for this account. The history of previous attempts to raise money for advertising honey indicates that nothing of the sort is possible at present. In fact it is doubtful whether $10,000 net could be raised at present by popular subscription from the beekeeping population of the entire country.

Surely there must be some basic reason for this inertia among beekeepers. We believe that one of the fundamental reasons, is the fact that at present there is not sufficient margin between the car lot price and the retail price. It costs hard cash to sell goods. Ten cent honey

in 60 lb. cans represents an investment of at least 65c per five pound pail. If sold through the regular channels of trade, which is the course followed by competitive articles such as jams and jellies, this honey would have to retail for at least $1.25 per pail. Yet the popular price for the five pound pail seems to be $1.00,—and often less.

This absence of a legitimate profit in the jobbing of honey in retail packages discourages those distributors who would carry honey in their line if it paid its way. One wholesale grocer recently remarked to the writer, "We used to stock honey, but the local beekeepers sold the grocers at the same price they quoted us, and maybe sold to retail customers for that same price, too. What is the use of our bothering with something that doesn't pay?"

It is probable that one of the reasons for the present inactivity of the honey market is the fact that many of the bottlers who have heretofore distributed honey locally, have been practically forced out of the game this year by the ridiculously low quotations on water white honey in car lots from the far west. These smaller bottlers find it difficult to finance large purchases, and cannot meet quotations of more fortunate competitors. The local market suffers from their inactivity, and the net result to the industry is depressing.

Realizing conditions as they actually are, beekeepers will do well to take a hitch in their belts, get down to business and apply sound methods to the marketing of their honey. It would help materially if all honey producers could become familiar with the campaigns put on by the large manufacturers of food products when they bring out a new item, for instance a candy bar, and try to "Put it over" as they say. If all the beekeepers could look behind the scenes and see how much work and money is spent, not only for advertising,—newspaper, poster, window trims, etc., but also in personal solicitation of the trade,—wholesalers and retailers, and how much sampling is done,—not only at first, but over and over again until the accumulative effect of constant plugging has forced the particular product upon the public's attention. Then, if the product is good, if it is something people will buy again and again, the campaign will have been successful.

If it were possible to organize a company, corporation, syndicate or cooperative financially capable of handling at least one thousand carloads of honey a year, the sort of campaign for obtaining distribution, mentioned above, could be applied. And, incidentally, the retail price of honey could be materially improved. A relatively small surplus can throw a market out of balance quickly, as we have seen in regard to honey, and such an agency, through intelligent advertising, could ease an otherwise difficult situation. In this connection, full credit must be given to the Ontario Honey Producer's Co-operative for the splendid work it has accomplished.

Few beekeepers realize the tremendous importance of the decision of the W. K. Kellogg Company to carry good will advertising for honey on their 325,000,000 packages output yearly, in the copy going to over twelve hundred newspapers, in recipe booklets, health articles issued from their Home Economics Department, and lastly, in their window trims. The lithographed picture of a jar of honey on the Kellogg Company's grocery store window trims will be worth more to the beekeeping industry in good will advertising than though the beekeepers themselves were paying the bill! For here is a firm of established reputation for truth in advertising, backed by a world wide authority on health, recommending honey to the American public. Who can estimate the money value of this gift to the beekeeping fraternity?

The results to be obtained from this advertising, in creating demand for honey, depend upon the beekeepers themselves. Of first importance is honest grading and packing. A large department store manager operating a grocery in connection, said that honey made the poorest appearance of anything he carried in stock. We must dress up our honey packages. If we would really build up a local trade, we should sample the public as much as possible, getting as much publicity for the brand as possible for recompense. Ask the salesmen who have helped "Put over" new lines of food products in their territory, articles that may have met with real sales resistance at first, but which later proved to be steady sellers, and they will tell you that sampling the product itself is the best way to get folks acquainted with it.

Even when the product is well known, and has been advertised extensively, sampling is continued by the manufacturer. The manufacturers of Jello, Postum, Corn Flakes, and even Oh Henry, sample extensively while carrying a heavy advertising campaign. For today, the sales pressure behind leading lines of food products is so strong that it is not enough for a product to be well known; to sell, it must be kept before the eyes of the public every moment.

Our advertising problem is comparatively simple. If we were trying to sell a new product that had never been heard of before, we would need to spend much money to educate the public to its use. Few persons in the entire country are ignorant of what honey is, and the majority like honey already. Our problem is to get honey into their mouths. We may spend fifty dollars in classified or display ads in the local paper and never come to know whether prospects were reached or not. But if we distribute fifty dollars worth of our best honey at lodge suppers, club luncheons, bazaars, picnics, church benefits, in fact wherever good folks congregate, we are sure that many prospects have been reached who might read a dozen ads without tasting honey.

And after all is said and done, if we had an advertising fund sufficient to buy space in Good Housekeeping, the real benefit would come only through quick follow-up by an active sales organization. We beekeepers may as well realize that in the last analysis it is up to us, personally and individually, to sell every pound of honey that we can, at a reasonable and fair price, as near home as possible.

And let's not be downhearted. "Sunkist" brand was first advertised in 1896. Wrigley waited 17 years before he commenced national advertising, and then he spent $300,000 getting into the market in New York City alone. Although leading firms have spent thousands of dollars advertising honey, the beekeeping fraternity as a whole is just being sold on the idea of advertising HONEY. If beekeepers would "Cluster" like the bees, for their mutual benefit, the problem would be less difficult. For if ever the industry needed the active co-operation of everyone concerned, that time is now.

PRODUCE AND MARKET BETTER QUALITY OF HONEY

Ralph L. Parker, Manhattan, Kansas

The producer of crops in the United States at the present time is calling for better marketing conditions. In some lines of production he has gone so far as to call for legislative action along lines of marketing. This condition has not been created by the producer, but by professional reformers. The producer in many instances has fallen down on his marketing program. Is this true of the intelligent and progressive producer? No. He has kept abreast of the times in improved methods of production and the use of short cuts to lessen the cost of production. In other words, this producer has been growing crops of better quality by improved methods and at the same time has lowered the cost of production in each case. What happens when the products are placed on the market? To start with, the crops have been grown better and, therefore, will grade up better. The cost of production is less because improved methods in handling have been utilized, and in this way a larger profit comes to the producer.

Beekeepers are included in this same group that are calling for better marketing conditions. As yet, they have not called upon Congress to

enact a marketing law, and probably will not do so. They are making new markets by selling more honey locally and providing new products. If the crop is short in one part of the country, it usually can be supplied from another part and in this way a beekeeper is able to hold his local trade. But there is a thorn in the flesh and that is the price cutter. This individual is dissatisfied with the movement of his product and to get rid of it sets a ridiculously low price for the sale of his wares. This type of producer, when he sells, is not giving the others or himself a fair deal. If this price cutter were producing a crop of good quality and under good production conditions, he would be obtaining a better product and, because of the reputation of a good product, would be securing a good price. It is a well known fact that a product of standard quality and in a standard container, which has a good reputation, sells much quicker and for a better price than a nondescript product and package. Behind all this is the type of individual who is directing the business. He is the one who wills that the product shall be of such a standard as he is able to control it, and also the kind of package in which the product is to be carried to market. He builds a reputation for his product and for himself, also with that reputation is built good will. In many cases a man's name is associated with a product, but sometimes in its place is the trade mark. The trade mark in many instances means more to the ordinary buyer than a man's name. This is because the trade mark is perhaps a word or two, an emblem or symbol. Slogans are often used to assist the trade mark or trade name. Before a trade mark or trade name is used, the producer of the product, to carry the symbol, should standardize his product and also the container. Why is this? The consumer buys once and finds the product of a certain quality. When he buys again and the product is not the same, what happens? The consumer is thoroughly dissatisfied and future sales are cut to zero with that individual. Successful marketing is placing before the public a product of such quality within a quality package that once sold means continued sales. Of course, this does not take into consideration the rapid demand which is caused by widespread advertising. This kind of advertising causes a large and voluminous demand. The basis of the successful rapid movement of the product is the quality of itself and its container.

The price-cutter does not have a place in this scheme of marketing, except to break it down. He sells at a cut price for one of three reasons—the quality and package is not good, he sells quickly for ready cash, or the value of the product is not realized by the producer-seller. It is this type of individual who breaks a market for the time and injures it indefinitely.

The apiarist in the northern regions is primarily concerned in honey production. He deals in extracted, comb or bulk comb honey or all three. Well ripened honey will weigh twelve pounds to the gallon, but when extracted honey is sold, it is not sold by the gallon, but by the pound. Well ripened honey does not spoil (ferment), except when exposed to humid conditions. Many thousand pounds of extracted honey each year are a total loss to the producer since the honey was not properly ripened or is poorly cared for after extraction. This would indicate that the producer needs a better system of management in the apiary as well as in the extracting and packaging of this product. Comb honey is always thoroughly ripened before it is removed from the hive, and because of this, spoiled (fermented) comb honey is never seen on the market.

Extracted honey is graded according to color, body (viscosity), flavor and, when ready for the retail trade, the container. The weight, as was stated earlier, is constant, since it is sold by the pound. As a general rule, where possible, the producer makes an effort to keep the various kinds or flavors of honey separate, since in some regions there may be one to three distinct honey flows. As a general rule, the darker honeys

are more pronounced or stronger in flavor than the milder, light-colored ones.

Comb honey has not always been graded as to weight first and then as to color, finish and flavor. In the past this product has been sold on its appearance with a range in weight within certain limits. This way the producer will spend a little more time grading but it will pay him, since he will receive a better price for the heavier sections. Comb honey does not spoil as readily as extracted, but it is more fragile. For this reason, more care must be taken in preparing a shipment. "Weeping" honey is not pleasing to handle, nor is it inviting to the consumer with bits of dirt stuck to it.

Bulk comb and extracted honey are packed for the retail trade in similar packages. The most pleasing to the eye is undoubtedly the glass jar and it is the most expensive. It comes in four sizes at present—two ounces, one, two, and three pounds. Other containers are used and in the order of their attractiveness are lithographed and tin pails in two and one-half, five and ten-pound sizes. Comb honey, on the other hand, is marketed in the section in which the bees stored the honey. When this fragile product is shipped, it is necessary to protect it from severe shaking or jolts.

The cases which hold twenty-four sections are the standard, but they do range from twelve, eighteen, twenty-two to twenty-four. All of these on the inside are cushioned top and bottom with corrugated cardboard. The wooden cases should be cushioned from each other in the shipping crate. The bottom of the crate should have a large cushion and the cases within the crate protected on all sides with straw. Provide handles for carrying and toes to prevent the crate from tipping over.

The honey producer who is not putting out a first-class product at the present time is going to lose out in the markets in the future, since these markets will demand standard quality in the food products sold. Better production methods will have to be used in the elimination of lost motion and unwise manipulations. Local conditions will need study as to honey flows, brood-rearing peak, swarm control, weather conditions of the year, and apiary management. Grade the honey better and use an attractive package that will do considerable talking for itself and you.

INSPECTION WORK DURING 1926

F. B. Paddock, Ames, Iowa

The season just closed has been an exceptional one. We have been able to do much more inspection than has ever been possible before. This has been due to the co-operation of the Agricultural Extension Service which made it possible to employ more help than during the past seasons. The inspection force consisted of one inspector for six months, from April first to October first, and one inspector for three months, from April first to July first. In addition to this some inspection work has been done by the Extension Specialist and by the State Apiarist. It will be noted that the aggressive inspection campaign started two months earlier this year than in former years.

The general inspection work was discouraged from the very beginning this year. This allowed a concentration of the effort on definite areas. These areas were worked intensely with very effective results. It is not possible to do away with the miscellaneous inspection entirely and it is not wholly desirable to discourage such effort. In fact a strict interpretation of the law makes it necessary to inspect when a written request is made, but anyone can see that it is not feasible to conduct a "Scatter-shot" campaign against disease in this state. With the funds available all our effort has been focusing especially strong during the last three years on area clean up.

We have, no doubt, reached an accumulative benefit this year. In all of the areas of intense inspection work we have found the local co-operation very good. Wherever possible, the work has been conducted through the Farm Bureau Office, in such instances the work was well organized. In a few places it was necessary to work with a local group of organized beekeepers.

A very definite policy was established this year of leaving a clean-up order wherever disease was found. It was our aim this year to get rid of disease. The number of colonies inspected may be greater in total but may not be as great on a basis of days of work. To leave an order to clean up automatically called for a visit by the inspector and in some instances as many as three visits in a locality. For the first time in the history of the inspection work the records will show that the disease found was either treated by the inspector or the owner, or the disease was destroyed by either the inspector or the owner. This is an unusual departure for the work in this state, but it is exactly what the progressive beekeepers want. We believe, that our record this year will meet the approval of every modern beekeeper.

The work of the season will be reviewed briefly by districts.

WEBSTER CITY. In and around Webster City are a good many small beekeepers. Honey has been produced for a good many years and the disease has gotten into these yards and caused a serious loss. As is typical in such a situation a good many colonies of bees die over the winter and any colonies that remain have robbers on hand very early in the season. Some of the first inspection work was done in this vicinity and some clean up was made. It was necessary to make a total of four visits to this territory to get all diseased material taken care of. A small beekeeper who has lost all of his bees can hardly appreciate the expenditure of cleaning up. Work ought to be done very early next year to check on the late work of this year.

CEDAR FALLS. The situation around Cedar Falls is much the same as described for Webster City. The smaller beekeepers have allowed disease to get into their colonies and let it spread without taking any steps to remedy the situation. During the season four visits were made to this area with very satisfying results. Each time the return or clean up visit was made, additional bees were found and in every instance disease was present. Again we found the beekeepers very slow to clean up unless it was evident they would be forced to. This district needs early attention next spring to take advantage of the work this year.

CHARITON. The work in this vicinity covered three townships adjacent to the town of Chariton. The territory was thoroughly covered but very little disease was found. This was handled very readily without a return visit. The work should be continued in 1927 to extend to the entire county.

DYERSVILLE. Considerable work was done in and around Dyersville in Dubuque County. Some work was done just across the line in Clayton County. Beekeeping is an old established occupation in this section and it is hard for many to realize that disease has come in on them and destroyed their colonies. In one instance diseased material was moved in defiance of a clean up order of last year. It was necessary to take the most drastic measures of any place in the state. The clean up orders were intentionally disobeyed so in order to get action it was necessary to carry one case to court. The beekeeper obtained a suspended sentence after paying costs and the clean up work continued in regular fashion. A large accumulation of clean up material which was wilfully neglected by the beekeepers was destroyed by the inspectors. Our results in this county were very satisfactory for the

progressive beekeeper and an effort is being made to put on a more compressive campaign next year.

COUNCIL BLUFFS. In the territory adjacent to this town much honey has been considered produced in years past. Disease has been slowly and effectively taking its toll and some of the smaller beekeepers have lost all of their bees. All of the beekeepers seem to be very indifferent to clean up work. In spite of this a large amount of inspection work was done and in a number of instances it was necessary to leave a clean up order. The work covered three townships very thoroughly. On a return visit treatment or destruction was completed by the inspector where the beekeeper had failed to comply with the order. Work will be needed badly in this territory next year to check on the results of this work this year. It is hoped that more territory may be included in the clean up next year.

IDA GROVE. Work was started in Ida County as a policy of extending our work in all directions from Woodbury County. Not all the county was covered this year. Some disease was found, but the results of the work are highly satisfactory. More work had been planned than we could get done and it will be necessary to start work in this county early next year.

WOODBURY COUNTY. Disease control work has been conducted systematically in Woodbury County in the seasons 1924, 1925 and 1926. The work of the first two seasons was largely in the nature of survey work and, in fact, the entire county was never covered until this year. The work was started in this county April 1 of this year and continued almost without interruption until October 1. It was possible to take advantage of the work of the past two seasons, but this year it was possible to do more thorough work and establish a real county wide campaign. The results of this work are more gratifying. Foulbrood has been cleaned up wherever it has been found. It will be necessary to make a thorough check of diseased apiaries in 1927.

It is well to take a perspective of this season's work since it is the first time we can get a true interpretation of the situation. It is very evident that it has cost considerable money to have a return visit of the inspector to make certain that clean up or destruction has been done by the beekeepers. Probably we are not ready yet to make the next step as is being done in Wyoming. There the treatment or destruction is done on the spot by the beekeeper or the inspector and the return visit in ten days is not necessary. Probably we are not ready in this state for another step which is the liberal destruction of the material which has been used in connection with diseased colonies rather than the delayed treatment.

The demand for the work is far greater than we are able to attend to, in fact it was hoped that work could be started in more places and furthermore, every place reported above felt that they would receive more attention this year. Our greatest handicap is the lack of funds. This will be helped a great deal if the present legislative program can be carried. You have been acquainted with the fact that the budget of the State Board of Education carries an item for $6,000 per annum for inspection work, the matter is now in the Budget Trust's hands. It will come before the legislature this winter. Your legislative committee will keep in touch with the situation and will notify you when it is necessary for you to do your part in securing these funds. In the meantime, go to your Senator and Representative personally before they go to the legislature and pledge them to support this item.

County	Number Apiaries	Number Colonies	Number Diseased
Black Hawk	25	162	53
Boone	2	11	5
Buchanan	2	22	1
Calhoun	5	11	5
Cherokee	15	140	9
Chickasaw	12	104	91
Clayton	2	13	None
Dallas	24	261	24
Davis	2	44	None
Decatur	1	160	None
Delaware	6	166	59
Dubuque	21	412	76
Greene	3	70	None
Guthrie	1	100	None
Hamilton	9	193	110
Harrison	4	443	30
Humboldt	1	11	8
Ida	94	749	80
Linn	11	66	16
Lucas	68	305	93
Mahaska	9	76	44
Madison	1	29	None
Mitchell	7	110	45
Monona	6	19	2
O'Brien	1	150	None
Plymouth	3	65	10
West Pottawattamie	116	1,017	476
Sac	5	20	4
Shelby	4	41	None
Story	2	13	1
Tama	6	63	3
Van Buren	1	15	1
Woodbury	322	5,719	526
Wayne	1	252	3
Wright	2	28	None
Totals	794	11,071	1,779

THE PLACE OF CHEMICAL DISINFECTANTS IN AN AREA CLEAN-UP CAMPAIGN

S. B. Fracker, Madison, Wisconsin

The discovery of Hutzelman's solution caused a great sigh of relief to go up from American beekeepers, particularly those in states where American foulbrood is a continuous threat. With the hope that in the future combs from infected colonies would not have to be burned or melted, the greatest source of loss from this disease was cleared away. There has been a tendency, however, to carry this optimism farther than the situation justifies. Many beekeepers have said that now the American foulbrood problem is solved, that we need worry about it no longer, that a cure-all has been discovered which will wipe out the disease in some magic fashion at little or no trouble of expense. This paper is written for the purpose of analyzing the situation as it exists at the present time and determining just what part Hutzelman's solution and other chemical disinfectants have in a campaign to free a particular area from the ravages caused by the American foulbrood disease.

The essential feature of a clean-up campaign, whether it is carried on under that name or merely as an apiary inspection project or bee disease control, are three in number. They are:

First, the discovery of every apiary in the district.

Second, the discovery and correct diagnosis of every case of disease in the bees, and,

Third, the control and if possible, the eradication of such infection as is found.

In times past beekeepers and inspectors have often overlooked the the importance of the first of these features and somtimes even the second. No royal road to the discovery of every apiary has been found, although different shortcut methods have been proposed and tried. The most popular of these is that of the compulsory registration of the beekeepers. That has not been adopted in Wisconsin because it is believed that it would be just as hard to find the beekeepers who neglect to register as it is to locate all of them at the present time and that the cost of enforcing the regulation would be greater than the benefits to be expected. The only way, therefore, in which we in Wisconsin are trying to locate every apiary and thereby every case of disease is to hunt for the bee yards by searching along every country road, inquiring, of course, as we go.

It is also important to discover and diagnose, correctly, every case of disease. If the inspectors are not sure, microscopic diagnosis is always made. In this connection it is essential that every colony in every apiary be examined, regardless of the confidence the inspectors may feel in the ability of the beekeeper to discover and diagnose his own cases of infection.

It is clear that chemical disinfection, therefore, must relate to only one of the three factors of an area clean-up campaign; namely, that of the eradication or control of the disease. But, when we examine the work of eradication, we still find that there is a great deal to be done in which the formaldehyde solutions cannot be of assistance. The various problems in eradicating disease from a given yard involved what to do, first, with the living colonies found infected; second, with the living colonies not found infected; third, with the honey; fourth, with the metal equipment, such as the extractor and tools; fifth, with the wooden equipment, including supers, frames, comb honey sections, top and bottom boards and similar material, and, sixth, with the combs themselves.

Every beekeeper and inspector recognizes the importance of looking after the first and last of these sources of infection, but neglect of the other four is a frequent source of future trouble. Even if the living colonies found with American foulbreed are destroyed the chances are that some infection has gotten into one or more of the remaining living colonies of bees and has not yet developed to a stage at which it has been discovered. There is, also, almost always honey on the premises to which the bees later secure access and which may have enough bacteria in it to cause new infection. Both the metal and wooden equipment, whether known to have been used with infected colonies or not, are prolific causes of trouble also.

None of these problems can be successfully handled with chemicals. The only way we can provide for the living colonies is to make successive reinspections until we are sure we have discovered every case. The best thing to do with the honey is to see that it is in closed containers and is used for human food at the earliest possible moment as its value for that purpose is not decreased in the slightest. All honey, which cannot be marketed immediately for human food because of its quality, should be boiled, and if it occurs on the tools and on the floor and bench of the honey house, it should be thoroughly scrubbed up and the water poured into a pit and covered up. The metal equipment should be thoroughly scrubbed with boiling water and the wooden equipment boiled or scorched.

We come, at last, to the beekeeper's favorite and most valued piece of property, his extracting and brood combs. It is in the disinfection of these that Hutzelman's solution and the water-formaldehyde solutions are of value. Even here they are of great importance as a safety measure than as a direct disinfectant of known diseased combs. When the owner of commercial apiary has half a dozen infected colonies one year, two or three the next, six or eight the next and one or two a year for several years after that, it is certain that some disease is being carried over in the extracting combs. At the same time, while he may not object to killing off the diseased colonies, he may feel very much put out at the idea of sacrificing from two to ten thousand extracting combs

just because some of them have had infected honey in them and because he cannot tell which they are.

In circumstances like this, the chemical disinfectants are the only solution. We belive that they are scarcely worth while for the beekeeper who has less than three or four hundred combs on hand. The bee journals have published descriptions of small ten-frame tanks for the use of beekeepers who have only a few frames on hand but the original cost of solution is so great and the labor of getting the tanks ready and transferring the frames every second day is so tiresome that the chemical disinfection of a smaller number of combs is not recommended as efficient.

It is scarcely necessary to outline at this time the method of using Hutzelman's solution or water-formaldehyde. It consists, as you know, of several steps:

1. Uncapping every cell in all the combs and carefully extracting any honey which may be found in them.
2. Soaking the combs twenty-four hours in water.
3. Extracting the water.
4. Soaking them forty-eight hours in the formalin solution.
5. Extracting the formalin solution and saving it for future use.
6. Airing or rinsing the combs in clear water to make them attractive to bees again.

Dr. Sturtevant has shown in recent publications that a mixture of commercial formalin, such as can be secured through drug stores, with water in the proportions of four parts of water to one part of formalin, is just as successful as Hutzelman's solution, provided every cell in every comb is carefully uncapped. In either case the solution ought to be analyzed after it has been used with two or three thousands combs, in order that the formaldehyde which has evaporated may be replaced in proper amount.

Chemical disinfection adapts itself to community work very nicely. In Wisconsin it has been tried in different ways in two different counties. The state has an outfit with a capacity of one hundred combs in formaldehyde and one hundred more in water at any one time, enabling the beekeepers to handle about three hundred combs a week. An extractor is included with the outfit so that there may be no danger of mixing honey with the solution. This equipment is mounted on a trailer and may be moved from place to place by towing.

In Rock County it was moved from yard to yard, the county inspector taking it to its new location as soon as each beekeeper had finished with it. The county inspector also gave instructions to the beekeepers as to the method of use and started them off with their first batch of combs. In Ozaukee county, on the other hand, a permanent station was established, and the combs were brought to the apiary at which the equipment was set up and were treated there. In the latter case it was, of course, necessary for them to pay a small charge for the labor of transferring the combs from one solution to the other and extracting them twice, as well as paying the cost of solution.

In Rock County 2,900 combs were treated. It took 65 gallons of liquid to cover the 100 combs and they found it necessary to add about 4 gallons of fresh solution to each new batch of combs to bring the volume up to the required amount. The Rock County beekeepers used 150 gallons of solution for the 2,900 combs and had enough left at the end to cover 50 combs. The material cost about $1.50 a gallon and the average cost per combs amounted to 6 1-3 cents.

Analysis of the remaining solution a few weeks ago showed that the work had weakened the liquid somewhat and that it was necessary to add one part of commercial formalin to every twelve gallons of solution still on hand. This addition brought the disinfectant up to the original strength.

In Ozaukee County 4,838 combs have been disinfected to date. The cost of the solution was $105.75, consisting of 70½ gallons at $1.50 per gallon, and the labor cost was $133.05. The total amount to $238.80 or about 5c per comb. Apparently, there was less waste of material where all the work was done by one man at one location.

In the case of community disinfecting plants the problem of financing the work is the most difficult one. The method used by both Ozaukee and Rock Counties was for the beekeepers to put up an initial assessment of ten to fifteen dollars apiece in a special fund in the hands of the secretary or treasurer of the County Beekeepers Association. The solution was purchased with this amount and all the solution used on the premises of one beekeeper was charged against him. If he used more than would be paid for by the initial investment, he paid the balance into the fund.

The state equipment is of such shape that enough solution must be used to cover at least fifty combs. At the end of the work this amount was on hand, although it has deteriorated and discolored somewhat. It was sold at a reduction to one of the beekeepers and the fund closed out by distributing all that remained to those who had made the original investment.

If one of the beekeepers is willing to take over this entire work and look after it himself, the simplest way is for him to finance it and to charge not only for the original cost of the solution and the labor but a small margin to make up for the decreased value of the solution after the work in his locality has been completed.

The writer considers the use of disinfecting solutions for the treatment of all combs in infected apiaries one of the most valuable of recent contributions to beekeeping methods. They are recommended to every beekeeper who has enough combs on hand to justify their use and in all cases every comb on the premises which is worth saving should be treated. All the others should be destroyed before the work begins. The only exception are combs that are, in fact, inside the hive with living, healthy colonies of bees at the time the treatment is being carried on. After the treatment is concluded, every colony subsequently found diseased and every comb which has been in a hive or super with it, should be immediately destroyed. If the work has been done well and if other sources of infection in the apiary have been cleaned up, the number of infected colonies to be destroyed will be very small.

PRODUCING COMB HONEY THAT CAN BE GRADED

By E. L. Sechrist, Bureau of Entomology, Washington, D. C.

Leaving out of this discussion the important item of the actual preparation of colonies for the honey flow, which belongs to another phase of beekeeping, the production of comb honey that can be graded may be divided into three parts:

1. Preparation of equipment.
2. Using this equipment during the honey flow.
3. Care of the surplus honey.

Preparation of Equipment

Great losses are sustained by the beekeeping industry because the preparation of equipment is often put off until the time when it is actually needed. This procrastination even extends to the ordering of supplies, which is sometimes delayed until the last moment, frequently resulting in disappointment on account of some unexpected delay. The only safe rule is to prepare, during the winter, every possible item of equipment, so that nothing is left to be done in the spring except putting up sections and filling them with foundation. This many beekeepers think, is best done as nearly as possible to the time when they are to be used.

To secure best results, standard supers with proper bee-spaces must be used, and all new equipment purchased should be for 4¼x4¼x1⅞ two bee-way sections.

Supers and sections must be scraped free from propolis, so as to avoid loss of time when filling supers with sections. More propolis will be deposited on sections in dirty supers than if the supers are clean. When separators are cleaned, the good ones can be counted and as many new ones as needed purchased. It does not pay to try to raise comb honey without using separators. Care should be taken not only that separators are clean but that they are not warped, or bulged, or broken, either of which would result in unevenly built combs.

New, clean, best-grade sections should be used for all honey that goes into the wholesale markets. Those who sell their product on their home markets can profitably use second-grade or off-color sections if their customers do not object to them; but for the city market there is no question but that honey stored in brown or buff or streaked sections, or in sections stained with propolis, is more difficult to sell than the same grade of honey in clean, white sections. Every effort, therefore, should be directed toward having all honey going into the wholesale market exhibit as perfect an appearance as possible.

These sections must be filled properly with thin surplus foundation. To produce honey of the finest appearance, full sheets of foundation must be used, and in most cases bottom starters are necessary. It is also necessary that the foundation be placed in the section always in the proper way to insure uniform finish and beauty of the completed comb. This means that always the cut edge of the foundation must be attached to the wood. The rows of cells will then run crosswise of the section, giving the comb a much better appearance than if the rows of cells run vertically. This is of importance, but it is not always done. The difference in appearance may be seen readily by taking two sections of honey of equally good appearance and giving one of them a quarter turn.

To promote the necessary uniformity and beauty of appearance, all sections should be placed in the supers with the dovetailed corner at the bottom.

After sections are filled with foundation they must be wedged or clamped in the supers so as to be perfectly square, because otherwise difficulty will be experienced when packing honey in the shipping cases. Neglecting this point of having all sections square results in many sections being slightly cracked, either when being packed or in shipment. These hairline cracks result in slight leakage which disfigure the surface of the comb, soils the section and case, irritates the broker and retailer and lowers the selling price of the honey and the consequent profits to the producer.

No other one thing so hurts the sale of comb honey as broken and leaky combs on the retailers' counters or shelves. Much of this breakage can be prevented by the use of full sheets of foundation and bottom starters and by careful squaring of sections in the supers, both these items being included under preparation of equipment.

The remaining item of preparation is that of paraffining the tops of sections after they are in the super.

Paraffining Tops of Sections

This is an old practice, said to have been originated by Harry R. Warren, of Nevada. While it is largely used in the west, and to a limited extent in the east, it has not come into general use. It is of such great importance, both to the beekeeper and in promoting the good appearance of cases of honey, that it ought to be universally followed. If paraffining is done properly very little propolis will be deposited on the tops of sections, and what is placed there can be scraped off readily, leaving the section practically free from stain. The cost of paraffining

is probably less than three-fourths of a cent per case, and the labor saved in scraping sections is worth much more than that. Again, unused paraffined sections are practically as good, even though kept over for a season, as when first put up, not becoming dirty and discolored. Those who use bait sections will also find paraffining very valuable.

Only the best paraffine with a high melting point should be used. Paraffine of low grade discolors at a temperature too low to permit good work, and also imparts a greasy look to the top of the section. A pan of hot paraffine, of ascertained temperature, and an ordinary varnish brush, should be provided, and a thin, smooth coat of paraffine applied to the tops of the sections after they are in the supers and before they are given to the bees. The brush, when not in use, must be kept continuously in the hot paraffine. Just before applying it to the sections, it is to be wiped off on the edge of the pan to remove the drip, when it is given one sweep, lengthwise, over the tops of four sections. The brush must not be worked back and forth; that will cause air bubbles and make an uneven surface. Supers should be tilted to an angle of 45 degrees and the brush given only one sweep down. This procedure will greatly aid in preventing smears of propolis over the tops of the sections. If the paraffine is at the proper temperature, and the work is well done, enough paraffine will enter the spaces between adjoining sections almost to prevent the deposition of propolis on the upper edges of the vertical ends of sections.

Using Properly Prepared Equipment

To begin with, a good comb honey location must be selected. It is useless to attempt to produce a fine article of comb honey in a locality having a long, slow, honey flow, or in one having several short flows separated by intervals of dearth. Neither should comb honey be produced in a locality where propolis is gathered freely, unless all comb honey is removed before the season when much propolis is being collected. Considerable injury to the market results from trying to sell honey having comb and sections stained by propolis. Lower prices are the result. In most markets dark comb honey does not sell well, therefore, the color of the honey produced in any region must be considered when deciding whether to produce comb or extracted honey.

For best results in comb honey production, a locality which produces an abundance of white honey should be selected. Nectar secretion must be rapid, as all activity must be very intense to produce a good quality and quantity of comb honey.

To assure the gathering and storing in the sections of this abundant supply of white nectar, the bee colony must be at its maximum strength and the bees of the proper age for the work they are to perform. A colony composed of old bees will not do good work in building comb and storing honey, nor can better results be expected of colonies composed entirely of young bees.

Given a colony of bees of the right strength and age, supers must not be put on too early or too late. If put on too early, the sections are likely to become stained or daubed with propolis and the foundation injured before the bees are gathering nectar. If sections are put on too late, swarming and loss of honey will be the consequences.

Obviously, one cannot always put sections on exactly when they are needed. The solution seems to be to have a two-story brood chamber, or one story and a "food chamber." The bees can then begin to store honey in this upper story, or food chamber. When storing has begun, the upper story can be exchanged for two comb honey supers, in which storing should begin immediately. It is a common practice, under the old system of using but one brood chamber, for the beekeeper to wait until white wax begins to show on the top of edges of the brood frames before he puts on sections. This is too late for best results, as such a condition does not exist until the bees are crowded. They are then de-

positing nectar in the brood chamber, thus crowding the brood and starting swarming conditions. They should have room outside the brood chamber to store this early, fresh nectar, or loss will result. This room is necessary, also, even before the honey flow begins, in order to provide clustering room for sufficient bees to occupy one or more supers as soon as they are put on. If all the bees fill only one hive body before supers are put on it is useless to expect them to fill twice that space at once when supers are added. Now, since sections are not to be put on before the honey flow, nothing else can be done except to provide this additional necessary room for storing and clustering, by using a second story or half story on the hive until the time arrives for putting on sections.

With properly prepared supers, with clean white sections wedged in tight and square, with separators to secure the building of straight combs, with the tops of sections paraffined, and with supers in place at the beginning of the white honey flow, on only those colonies that are strong enough to occupy the supers fully and at once, rapid work in the sections may be expected and a fine grade of honey should be secured, provided that supering is done to correspond with the honey flow. Proper supering is so fully described in Farmers' Bulletin 1039 "Commercial Comb Honey Production" that it is unnecessary to restate it here. Adequate supering in connection with proper strength of colony and immediate work in the supers, as already described, will largely prevent swarming, which must also be controlled if good quantity and quality of honey is to be produced. Methods of swarm control are described in Farmers' Bulletin 1198 "Swarm Control."

With properly prepared equipment used as described, the beekeeper should harvest uniformly filled combs, evenly sealed, with the wood of the sections but little stained with propolis.

Care of the Surplus Honey

All section honey should be removed as soon after filling as possible and before staining of comb and sections has begun. Some have insisted that honey remaining on the hive a long time is better flavored and ripened, but this is questionable, as the ripening process goes on anywhere with the proper temperature after the honey has been sealed, even after it has been removed from the hive. Any possible advantage in quality secured by permitting comb honey to remain a long time on the hive is more than offset by deterioration in appearance.

In taking off filled supers and driving the bees out with smoke, it is important to have the smoker always well filled with clean fuel, to prevent ashes or soot from soiling the sections or combs. This is of more importance than is generally supposed, and much fine honey goes into a lower grade when it reaches the market, just because some careless worker has blown soot or ashes over the combs and sometimes into partially sealed cells of honey. The purchaser does not like sections with black specks built into the wax of the cappings, or even black specks on the surface of the comb. He is inclined to think it is dirt, which quite too often is the case.

Clearing filled sections by means of bee escapes is good practice when local conditions are such that their use does not cause the bees to cut open cappings of sealed honey. If the honey is well sealed, either out to the wood or if the bees have removed all unsealed honey in the row next to the wood, so that no unsealed honey remains with which the bees may fill themselves when bee escapes are put on, cutting off cappings is almost certain to follow.

Robber bees must be kept away from filled sections at all times, to prevent damage to the combs. This is necessary while sections are on the hives above bee escapes, as well as after they have been removed from the hives. Care should be taken to see that any holes or cracks between supers or between cover and supers are carefully closed bee-tight when escape boards are put on. Then the honey house, or place

where honey is kept, must also be made bee-tight. It is frequently the case that a window screen is not sufficient to prevent robbing from a honey house. Most beekeepers have seen, at some time, a cluster of bees on the inside of a screen busy passing honey to bees on the outside of the screen. Comb honey has been cut and spoiled on this account, to the utter mystification of beekeepers who considered their honey houses well screened. Double screens are the remedy for this trouble.

As the filled supers go into the honey house, they should be piled up with one or more sheets of newspaper placed between the supers. Any drip from burr combs or leaking sections will then fall on the paper instead of on the sections in the super below. This paper will also keep out ants and dust. If any bees remain on the supers as they are carried in, the supers should be piled up crosswise of each other temporarily until all bees leave, otherwise, cut cappings may result from this cause.

In removing filled sections from supers care must be taken to loosen them in the section holders without twisting, otherwise many sections will be damaged by slightly cracking the combs. Such hairline cracks may be overlooked when the honey is put into shipping cases, resulting in leaks and loss in transit.

Cleaning propolis from sections of honey requires careful work. By practice and by study to avoid unnecessary motions, considerable speed may be acquired. The special knives devised for this purpose will soon save their cost by reducing the number of damaged combs.

To secure a crop of comb honey which will grade well, the essential requirements are a location in every way adapted to producing comb honey, properly prepared and properly used equipment, and colonies of bees of the necessary age and strength. The honey must be taken from the hive as soon as it is in suitable condition, and must not be damaged either by the beekeeper or by the bees. Such a crop of honey, with sections clean and well graded will bring good prices if it has not been broken in transit to market.

Breakage in Transit

Good honey must be well packed in order to reach the ultimate consumer in good condition. To secure the best prices, the surface of the comb must be absolutely dry on arrival at its destination. Utmost care in packing is the most dependable safeguard.

It is useless to expect truckmen and others to handle cases of comb honey with the same care that the beekeeper uses in getting it to his shipping point. Beekeepers might as well make up their minds to meet this condition. No matter how well the beekeeper or shipper packs a car of honey, provided honey is shipped in car lots, it has not reached its final destination at the end of its railway journey. It is removed to the warehouse of a broker, being handled several times by men who do not know how to handle honey, before it reaches the counter of the retailer. Most breakage occurs between the car and the retailer. There is no remedy but to pack the honey at the apiary in such a manner that it will reach the retailer with the comb surface absolutely dry. If it does not do this, it not only must be sold at a loss, but that retailer wants to sell no more comb honey. Thus the beekeeper finds the market dull and the price low. Not until beekeepers pack comb honey so that it will reach the retailer in good condition can they expect a good price and low freight or express rates. The railroads must protect themselves; they will not give low rates if 90 per cent of honey shipments are followed by claims for damage by breakage. If the beekeeper will not pack his honey as carefully as the value of his product demands, he is bound to receive low prices and pay high rates on the beautiful honey which it has produced and graded so well.

Although probably no other one thing is so important to the future of the comb honey trade as adequate packing of the finished product, proper

packing has not yet been devised. The Bee Culture Laboratory desires to make as soon as possible tests of various styles of cases and packing in the hope of determining just what is necessary to meet the difficult conditions existing in the shipment of comb honey. This work will be done as soon as funds are available for the purchase of sufficient honey to make the tests which, of necessity, must be rather extensive, and must be carried to the breaking point under uniform conditions, with honey of various grades and with various wooden and cardboard cases.

COMB HONEY PRODUCTION

John W. Schlenker, Des Moines, Iowa

I will follow the adage "There is no time like the present" in choosing a starting point. If the bees have not already been packed, the first thing to do will be to see that they have plenty of stores and protection to carry them through the winter. Each colony should have at least 40 pounds of good, well ripened honey, and packing enough to insure safe wintering up to the time new honey comes in the spring.

It is poor practice to unpack bees early in the spring to add stores as more harm is done in the operation than the loss of an occasional colony from starvation. If the spring should be very late, it is sometimes necessary to feed. This can be determined with a little practice by going through the yard and hefting the hives. If many are found that are short of stores they are fed in the following manner. On a warm bright day about three o'clock in the afternoon, take about three or four extracting combs per colony in the yard to be fed and lay them out flat on extracting supers placed several rods from the yard, and feed sugar syrup made by simply stirring granulated sugar into water, about two of water to one of sugar by weight. The feed is soon found and soon every colony in the yard is busy. In this way every colony in the yard can be fed enough to last a week or more at one operation without starting robbing, and without much feed going to outside bees.

The system used is a combination gathered from the teachings of Doolittle and Miller. When the bees get so crowded that there is danger of swarming, unpack them and give more room by adding a set of brood frames. Allow the queen free range of both hive bodies. This prevents swarming and insures strong forces of workers for the honey flow.

When the white honey flow is well started, take off these extra bodies, being sure the queens are left in the lower story. Use them for building up weak colonies, or for making increase. Then put on two comb honey supers at once. This is necessary to take care of the large force of bees on hand by this time. If this is done at the right time very little swarming will result.

I aim to have all queens clipped and by simply tipping back the hives about once a week I can determine which colonies need attention. Usually one or two examinations for queen cells is enough, the cells being destroyed of course. Supers are added as needed by lifting up those already on and placing those added underneath. This is continued until from three to five are on the hives, or until the flow shows signs of stopping. Then if more supers are given they should be placed on top. Generally by this time some supers will be finished and should be removed, freed from bees by placing over an escape board over night. Stack them up in the honey house until the honey is graded for market. Of course no hard and fast rule can be applied to all colonies, in all seasons, and the beekeeper must be governed accordingly. A few colonies will persist in swarming and it is better to shake them into hives filled with frames of foundation or work them for extracted honey.

It is best to do any requeening after the main flow is over and have it done by the middle of August. It is essential, to at all times to keep in close touch with what and when honeyflows may be expected to start.

Also when they may be expected to cease, is very essential, so as to be prepared to harvest them and to avoid being caught with a lot of unfinished sections.

When bees are worked for comb honey they usually have in the brood-chamber enough honey to carry them through the winter, but if they do not have enough it is well to add a set of filled combs over the brood-chamber to make sure. This honey is not lost if it is not used and saves spring feeding. It is not wholly satisfactory to feed bees sugar syrup.

Bees should be packed for winter as early as possible in the fall, as they will consume nearly as much honey in the fall if unprotected, as they do in the winter.

Now a few words about the super which is used. When I started keeping bees over thirty years ago, about all the leading styles made were tried out. It was found that the 4x5x1⅞ suited local conditions best, so now no other is used. It was hard to get sections heavy enough to suit the grocer. So when the 4x5x1½ sections came out they were tried in the 4x5x1⅞ supers and found to be very satisfactory in every respect.

Then someone got the split section idea which was a happy thought. They were tried at once and for years now only that style has been used. These sections can be used in the regular 4x5x1⅞ super by taking out one holder and putting in extra separators at the sides to fill up extra space. This gives a section that averages about a pound and is very acceptable to the trade. It does not get the comb so thick that it interferes with ripening the honey. More marketable sections of this style can be produced than any other. They cost no more, so why not give the trade as near as possible what it thinks it is getting? Never market anything of doubtful weight or quality. If all bee men did likewise there would be such a demand for "Nature's Best Sweet," at fair prices, that we could not supply it.

COMB HONEY PRODUCTION

W. W. Delahoyde, Dawson, Iowa

A beautiful thing in nature is a comb of honey with its snowy whiteness and its burden of sweetness. Aside from its whiteness and sweetness the marvelous structure of the comb compels our admiration. All of this produced in nature and never duplicated by human hands, though we may do much to aid in the perfection.

There are two things which are very essential in comb honey production, first a good honey flow and second, a hive full of bees of the right age to gather the nectar. To produce honey the colony of bees should be headed by a good queen, one which is capable of performing her duty of filling the hive with bees and then keep faithfully at the job.

In preparing the colonies of bees, during spring management, it is not decided which will be worked for extracted and which shall produce comb honey until the beginning of the main honey flow. By this time most of the colonies are in two ten frame hive bodies which at the beginning of the honey flow will be cut back to one ten frame hive body. This gives the single hive ten frames of sealed brood and all of the bees, which fills the hive to fairly boiling over with bees. The two things absolutely necessary for the production of comb honey; a hive full of bees and nectar coming in freely. The unsealed brood is placed upon colonies which have not developed strength enough to produce comb honey, and these are worked for extracted honey.

If we would have well filled sections with good attachment and snowy white cappings, we must keep the supers off until the honey flow is upon us, and then place the supers, filled with the best sections which we can buy, upon the hives. We use the extra thin wax which is melted in with a steel paddle using full sheets of wax in each section. A great

many use the top and bottom starter, however, we have been unable to get what is called fancy combs by using this method. This may be our fault as we perhaps fail to get the wax installed as it should be.

We should watch our supers closely and lift them up when about two-thirds filled and place the empty supers next to the hive body. When two or more supers are nearly filled it would be best to take them off and remove the nice well filled sections and assemble the partly filled sections in one super, placing the ones nearest complete to the outside and those not so well filled in the center of the super. As we near the end of the season and nectar is coming in slowly it is best to give supers sparingly, and only to those colonies which we know, after an examination within the hive, is in real need of them.

It is easy to get the imperfect combs of honey but no easy task to get the perfect ones, in fact very seldom do we find them. Sections given a colony of bees during a dearth of honey become stained and daubed with propolis, the wax is gnawed out in the corners and up the sides, and never will be made into an extra fancy comb of honey.

The split section has been upon the market for some time, however, this was our first season to use them. We feel that they have a place with every beekeeper and will do much in our locality to produce a better and more salable honey. Many of the smaller beekeepers will use them with a full sheet of wax, where they formerly used only starters, and every beekeeper knows the kind of a comb of honey starters produce. Mr. Coppin of Wenona, Illinois, who is known quite extensively as a comb honey producer, uses the split section, it being split through thus making two separate strips for each section which he puts together by means of a special press. In our apiary and the use of the split section, standard size, we do not feel that the bees made as smooth a face upon the combs as they did with the full sheets of wax melted in upon the same style section but not split. Those having out apiaries will find that the split section when put into the supers will stand a long ride over rough roads and still be in perfect condition while many of those melted in would be in the bottom of the supers.

ECONOMY IN HONEY PRODUCTION

By G. H. Cale, Hamilton, Illinois

The economic factor is one of the major influences in our lives and we are all fundamentally interested in the state of our pocketbooks. If the pocketbook is flat no optimist in the world can make the majority of us see the sunshine. If it is full all the world is bright and everyone is a good fellow.

Not even the preacher is exempt. I am reminded of a story of a colored doughboy in France who went in distress to the "Y" Hut and asked the Chaplain if he might write a letter to the Lord. "Yes", said the Chaplain, indicating paper and ink. The boy sat down, wrote his letter, and handed it to the Chaplain, asking him if he would send it to the Lord. The Chaplain consented and after the boy had gone he opened the letter and found the following:

"Dear Lord: I am powerfully in need of $25.00. Please send me same and oblige. Most respectfully, Sam."

The Chaplain was deeply touched. He asked some of his friends in and explained the request that Sam had made, saying that since Sam had such simple faith, it was a shame to disappoint him. Consequently, they took up a collection and got $15.00 (not $25.00) which was put in an envelope for Sam. When he received it, Sam came post haste back to the Hut where he wrote another letter to the Lord. This letter read, "I thank you Lord for the money but when you send money to me hereafter, please don't send it through no Army Parson."

The basis of economy in our beekeeping practices lies in keeping an

accurate account of expenditures and receipts. This of course entails the keeping of records. At the Dadant Apiaries, we have instituted a system of record keeping which suits our requirements satisfactorily and which has been of some interest to other beekeepers. I give it to you here for what it is worth.

We have three types of records, the apiary record, the colony record and the summary record. They will be considered in the order mentioned and sample of each type is given herewith to show the style and makeup.

The colony record, as you will note, indicates several things which are important for us to know in making up our cost of operations. It gives a strict account of labor and just how this labor is proportioned to the different kinds of work done in the yards and in the honeyhouse. It also gives a strict account of the mileage.

There are several things brought out by these records which will bear discussion. Under the item "machines" we show the kind of car used. In keeping a record of the cost of maintenance and operation of cars for several years, it has become apparent that the cheapest car we

APIARY WORK

Apiary Brown's Ford Date June 1 1924

	Time	Machine	From	To	Time	Miles
What done Gave full hive bodies		Small Ford	Home	B.Fd.	2hrs	24
as supers to 50-54-55. Gave						
supers throughout.	5hrs		B.Fd	Home	1½hrs	24
Looked at few for queencells					3½ hrs	48
and requeened 100-91-56	½ hr					
	5½ hrs					

What needed: Watch for supers in week

Signed: Geo. Watt 9 hrs; G H Cale 9 hrs — Total hours

What left:

Remarks: Clover fair. Some nectar. Black berries in bloom.

Apiary record

can use is the Ford. However, the rapid adjustment in the prices of cars which is taking place now may make it possible to use other cars to equal advantage.

The labor element in transportation is a factor not always so apparent as it becomes in our records. When it takes an hour and a half to go from one apiary to another, as shown in the record herewith, with two men in the car, three hours of labor are used without profit. It is highly important, therefore, that the work be arranged so there will be a minimum of labor of transportation.

The condition of the roads also becomes a factor of great importance. On a hard surfaced road, between the home apiary and our most distant eastern outyard, twenty-two miles away, the labor of transportation is only three hours for the round trip while a same amount of labor is usually required for the round trip to a yard only ten miles from home over a poorly conditioned dirt road.

The apiary record also makes it possible to keep an approximately exact account of the cost of labor for different kinds of apiary work. At the end of the year we can tell just how much time has been used in

requeening, uniting, packing, unpacking, putting on and taking off supers, extracting, keeping yards in shape, repair and conditioning of honey houses, and so on.

By skillful planning it is possible to handle the labor so that the most costly labor will be used for the most skillful work and the least costly for such work as cleaning up apiaries, painting hives, cleaning houses, and jobs of a more elementary character. It is also possible to arrange the work to be done so that all the labor shall be expended to the best advantage. It is necessary to give thought to planning by careful study of the current apiary records at the office so a work sheet embodying the directions and suggestions for the day's or week's work, can be issued, with everything arranged with a view to labor saving.

We have found it important that the trips to the outyards be started early in the morning, the load to be taken having been prepared the day before. Long busy days at the outyards are the most profitable. It has also been to our advantage to pay overtime so that the men will be satisfied to stay until dark at the outyards, if it is necessary.

Of course, this whole system is out of line with the possibilities or even with the needs of most beekeepers, unless they like ourselves, are engaged in beekeeping on a large scale, where it is necessary to hire men with experience and pay them well for their skill. The average beekeeper manages to do most of his work with his own labor or that of other members of his family, only occasionally needing to hire someone outside.

In our case, the most skilled men are paid as high as $4.50 a day and they often put in enough overtime to bring the average pay up to $5.00 or $6.00. This makes of beekeeping a business comparable to any other industry and is, I believe, the basis on which most business men would be apt to consider it. If it is not possible for beekeeping to show a profit, under such conditions, it will not be a permanent attraction to those trained for larger business enterprises.

The Colony Record

The colony record serves a useful but different purpose from the apiary record. The colony record shown here is one which was devised after communication with a number of men who we knew had used such records and were in a position to give us worth while opinions. Therefore, it is partly our own and partly a composite of other records.

Colony record

It was our intention when we first devised it, to keep a careful record of every colony in our apiaries but it soon became apparent that it would take one man's time to keep up the records while the other men did the work. This was too impracticable. After awhile therefore, we gave up the idea of keeping complete colony records and now only use them to keep tabs on abnormal conditions or things which need attention or continued observation.

The details of the colony records are apparent in the sample. The "Crop" item may need explanation. Whenever we put on a super we fill in the side lines appearing at the left of the horizontal lines under the heading and give the date as shown. The "Food" item was not as useful as we thought it would be and I find now that we even write in the words "short" or "O. K." less and less frequently. It should be used more.

The up and down lines, above the word "Food" represent the hive and its frames and here we mark such items as drone combs, poor combs, amount of brood, or other conditions. The drone and poor combs are later removed and foundation substituted.

The item "Weight" is for fall use and has become of less value now that the records are not used for every colony. The figure after the word indicates whether the colony has sufficient winter stores or will need feeding. The twelve large record squares are very convenient and allow a running record of the work on the colony to be kept.

We find these records of especial value to keep tabs on developing drone layers, queens which seem to be failing, suspicions of disease or colonies or queens of unusual value, and we always carry to the apiary so we can look over these numbered colonies without unnecessary examination. Usually the first thing we do in the yard is to attend to these colonies.

The Summary Record

From a study of the Apiary Records, we can make up a record which will give us the cost of operations for the year, at a glance. In the sample shown, I have divided the two elements, labor and mileage, as indicated. This is the first record made under this system and you will note, under the item "Crop Off," an excessively heavy expense both for mileage and labor. By a revision of the working schedule, which was previously poorly arranged, it was possible to reduce this item to very material advantage. The use of the summary record is apparent from one example. Since it is possible to bring about savings in the cost of labor and mileage by noting those factors which are above their estimated normal cost and having them as indicators, a study of the detailed work given in the apiary records will show how to plan changes which will be of value.

None of these records are presented with the idea that they are universally adaptable. It is most likely that they are not. Neither do I claim that they are ideal, and as soon as our present printed stock of records is exhausted, there are several changes which will be to our advantage to make. One trouble with records which is probably quite general is that there is a temptation to neglect making them out and also a tendency to slight the details of the record so they are of less value for analysis.

There is no way to make the individual keep a record if the task is distasteful but, if the value of the record becomes apparent most of the men are willing to do their best. Probably a much simpler record would be better in the small apiary. The form and kind of record is not important. The important thing is that some sort of a record be kept so that an approximate notion may be secured of the cost of production and of the exact amount of returns which the bees are giving. I venture to say that, if an honest and all inclusive record were maintained many apiaries would be found unprofitable.

One of the delightful things about beekeeping, however, is that the

Summary record

bees usually represent something more than profit and loss and to many the need of records is not great. They get pleasure and health and the out-of-doors as part pay and the fact that the bees may be costing them something above the returns is of no concern as it is money well spent. This element is decidedly a large factor in beekeeping and always will be. However, there are those of us to whom the bees mean bread and butter and it is to those that this particular article will appeal most.

INTRODUCING QUEENS

A. D. Worthington, Ames, Iowa

The queen being the mother of the entire colony, it is essential that we have each colony headed by a vigorous queen if we expect to get a maximum honey crop. One of the essentials of wintering of bees is a large number of worker bees reared since the main honey flow. This essential is provided for when we have our colonies headed by a good queen. Swarm control cannot be practiced with good results unless good queens are in each colony.

It is surprising how many of our beekeepers neglect or fail to a great extent to requeen or keep young vigorous queens in their colonies. I think I am safe in saying that the loss of honey in Iowa caused by poor queens is greater than the loss caused by American Foulbrood. In visiting thousands of beekeepers I can but be impressed while examining their bees of the larger number of colonies needing requeening. Some of our best beekeepers are caught with poor queens. On visiting one of the largest honey producers in the Midwest, I was told by him that one of his apiaries of something over 100 colonies would produce about one-fourth of a normal crop that year as they were hybred bees and European foulbrood had kept them weak. Every colony in that yard was requeened that summer. But do you realize that those inferior queens cost him approximately $10.00 per colony. Think of how much cheaper it would have been if he had only requeened them in the fall of 1925, yet it seems that so many of us require expensive experience to make us realize the importance of properly handling our bees.

The average beekeeper who attempts to introduce queens in accordance with directions he receives from various sources, often meets with failures, and becomes discouraged and gives up requeening to a great extent. Nearly every method advocated has been practiced successfully but in giving methods of introducing queens the one who has practiced this method successfully often fails to describe or give details of the conditions that were present when the method succeeded. The method used and the success of method depend a great deal upon conditions.

If one expects to requeen or make a success of beekeeping he must thoroughly understand conditions in his locality and know when to requeen and the fundamentals necessary for success in requeening. In making a colony queenless the bees in a short time realize that their queen has been removed from the colony. If a strange queen is placed in the colony the bees seem to realize that a strange queen has been given them. There is a scent gland on the abdomen of the queen and it emits odor which can be noticed by a human being. How much more apparent, therefore, it must be to the worker bees which are supplied with several hundred pores or organs by which they can detect odor. When a colony is dequeened the bees realize her absence at once and on returning a strange queen they also at once realize th presence of a queen. Yet each queen has an individual odor and the new queen will not be accepted until the odor situation has been adjusted to the satisfaction of the colony of bees. The extent to which the odor situation is adjusted determines the success or failure of a colony accepting a queen.

Queens are more readily accepted during a honey flow. Dr. Parks' statement, "Bees are guided by one instinct at a time" explains why queens are more readily accepted during a honey flow, as when the bees are busy bringing in nectar from the fields, their instinct to protect the hive seems to be lowered. Not only a honey flow is favorable for queen introduction because the instinct to protect the hive is lessened, but when nectar is coming in from the field the odor of the new queen which is antagonizing to the bees is counteracted or is not so prominent. This is not due to a change in queen odor but the odor of the hive has been changed by the incoming nectar. It can be easily seen that if a queen is introduced during a dearth she will meet with two unfavorable circumstances, first, the queen will meet the bees when their instinct to

protect the hive is most prominent and second, she will be in the hive when the odor is stable and at this time there will be a contrast odor between the new queen and the hive odor. Besides the new queen odor she will bring with her the odor of a foreign colony.

The odor of queen is weaker when the queen is very young or when the queen is moving about in a quiet and orderly manner and when the queen's physical vitality is low.

In introducing queens into demonstration colonies it is our object to use a method that can be used satisfactorily and at the same time a method that is simple as possible and will be used by the largest percent of beekeepers. The introducing of the queen in mailing or introducing cage seems to fit average conditions in Iowa, therefore, it is the method we use most extensively, stressing and demonstrating the faulty points.

The first step in introducing queens is to dequeen your colonies. The method used to find queens are governed to a great extent to the race of bees and strength of colonies in bees. Where the colonies are strong in bees and the bees are hybrids or black, the quickest and most satisfactory method is to drum your bees up through a queen excluder, the excluder being placed over your hive body and supers, the bees gently smoked through the entrance and the hive being drummed with a steady knock on each side. After 30 raps the supers quickly removed and excluder turned over on top of supers, the first glance being on top of frames to see the queen. In the majority of cases the queen will be found on queen excluder where she can easily be seen. If she is not to be found there the combs can be examined and as most of the bees will have been driven into supers it will be an easy matter to locate her on combs or in hive body. Where there are a few bees and they are hybrids or black bees the quickest method is to remove supers, place queen excluder on top of supers and empty super or hive body above queen excluder. The combs with the bees are removed from the hive body and bees brushed off into empty hive body. The bees will crawl to super below and queen will be found on excluder. As little smoke as possible is used to prevent the queen from leaving combs and going on to the hive body. If Italian bees are to be requeened it is an easy matter to locate queen by merely removing frames of brood and examining same.

Three methods have been used in requeening in demonstration apiaries, namely introducing in mailing cage and introducing cage, introducing into a nucleus or wire screen push in cage and Jay Smith introducing cage. When the mailing cage is used, the cage is suspended between two frames of brood in center of colony being certain that the wire side of cage is left free so that bees can crawl freely on the wire screen. If it was impossible for the beekeeper to look at colony and remove the pasteboard cover, the second day, the pasteboard covering candy end was broke in center and honey smeared on same to start bees to gnawing at once. The colony was then to be left undisturbed for 5 or 6 days, at which time the colony was to be examined to make sure the queen was released. In case she was not released the candy was dug out of opening, allowing room for queen to crawl out of the cage. The queen in cage after candy is removed was then placed into colony and hive closed. When the queen was released the colony was closed without further disturbing colony for 3 or 4 days.

The loss that occurred in introducing queens was in most cases due to no honey flow. Some loss was due to opening colonies too soon after queen was placed in hive or the queen was released by tearing screen from cage and letting the queen crawl in while colony was open and disturbed. The results were good when a honey flow was on but this method is only to be used where there is a honey flow. A comparatively large loss can be expected if this method of introducing queen is used when no honey flow is on.

A splendid method and a method that I prefer is to introduce your queens to a nucleus. The nucleus to be united to a colony to be requeened when honey is removed from the colonies in August or at any time when the beekeeper locates a poor queen. The queen can be secured in July or placed in nucleus to be united with the colonies any time during the month of August or September.

During the season just passed 310 queens were introduced into demonstration apiaries. 65 of these queens were secured in Iowa, 40 being taken from mating nucleus the day they were introduced into dequeened colonies. The 30 queens that were introduced to colonies the day they were taken from mating nuclei, were all accepted and were doing splendid. From reports from the beekeepers where they were introduced these queens were all out and laying on the fifth day. The queens were introduced by the Benton cage method and very little honey was coming in. 210 queens were introduced in Benton cage, 31 was introduced in Jay Smith push in cage and 49 were introduced to nucleus. 100 per cent were accepted where Jay Smith cage was used, 48 out of 49 were accepted in introducing to nucleus and uniting with colony. 85 per cent of queens were accepted where cage method was used.

Splendid results were secured in all methods where honey flow was on or where queens were introduced in July. The queens placed in the colonies in the middle of August were not accepted very well.

WHY BEES SWARM

Jay Smith, Vincennes, Indiana.

The swarming of the bees has always been an event of interest and wonder. How do they decide to swarm? As some bees go with the swarm and some stay with the parent hive, how do they decide who shall go and who shall stay? Bees will not go far when they swarm unless their queen goes with them. How do they know that she is not with them? When flying, a swarm sometimes is more than two hundred feet across. How do the bees know that the queen is not in some other locality in the swarm?

Some of these questions, we cannot answer and will let the reader draw his own conclusions. But as to why bees swarm, the answer is obvious. It is their way of making increase in accordance with the Divine injunction to "increase and multiply and replenish the earth." Therefore, it is perfectly natural for bees to swarm. The honey producer does not wish his bees to swarm for it is known that it is the strong colonies that produce the large crop of honey, so when bees swarm they use the honey to feed the brood instead of putting in into the supers.

While it is natural for bees to swarm, still there are several conditions present when a colony swarms. There is no single reason why bees swarm but at least two important conditions are present. The brood nest must be crowded with both young and old bees and the bees must be well fed with both nectar and pollen. Hungry bees never cast a swarm. They may abscond for lack of food, but in that case no queen cells are left in the hive. In queen rearing, it is found necessary to keep the bees well fed at all times to keep them from tearing down the queen cells. Hungry bees will not tolerate queen cells. So it is in swarming. If there is no nectar coming in and the bees are not well fed, they take it for granted there is no honey flow ahead and will not build cells, or if they have started some, they tear them down when the honey flow is cut off.

If we wish to prevent swarming we can help the situation a little by giving the bees a large brood nest with plenty of drawn combs. This to a certain extent relieves this congested condition in the brood nest, but still a certain per cent of the colonies will swarm. There still remains the fact that the bees are getting nectar from the fields and are well fed which causes them to swarm. Therefore, let us examine this problem of feed and see why it causes them to swarm.

When the nurse bees eat honey they secrete a sort of milk which they pass out through their tongues and feed the larvae. After experi-

menting for years in queen rearing, the writer is convinced that the presence of this milk or royal jelly as it is best known, gives the bees the swarming fever. If we can have the conditions such that the bees are relieved of this milk, the swarming fever will not remain with them. When the bees are secreting this milk in excess of what is required to feed the larvae, the swarming fever is apt to develop. In such cases, if more unsealed brood is given, it gives the nurse bees a market for this surplus milk in feeding the larvae and the swarming fever will disappear. The writer has taken advantage of this principle and has run outyards for a number of years with no swarming.

In most apiaries some weak colonies will be found, that will not be strong enough to make a surplus. Some of these will crowd the honey into the brood nest and swarm. In such cases it is good practice to take from them all their brood giving empty combs or full sheets of foundation in exchange. This prevents this weak colony from swarming. Later it can be requeened and it will build up strong for winter and if there is a fall honey flow, it may make a surplus. Now take two or three frames of the brood from this colony and give it to a strong colony that is apt to swarm. If two frames are used it is a good plan to put them in a super above an excluder and place them at the sides of the super filling in the space between with drawn combs. This draws up the nurse bees from below thus relieving the congested condition there. The bees will occupy the empty combs between. These two frames of brood also give the nurse bees a market for their surplus milk and the swarming fever is cured.

This method has proven most satisfactory in preventing swarming when run for extracted honey. When producing comb honey, swarm control is not so easily accomplished. The writer has followed the system outlined above till the swarming season had passed, then raised up the extracting super and placed a comb honey super underneath. When the bees were working nicely in the sections, the extracting super is given to another colony running for extracted honey.

THE TAR PAPER PACKING CASE

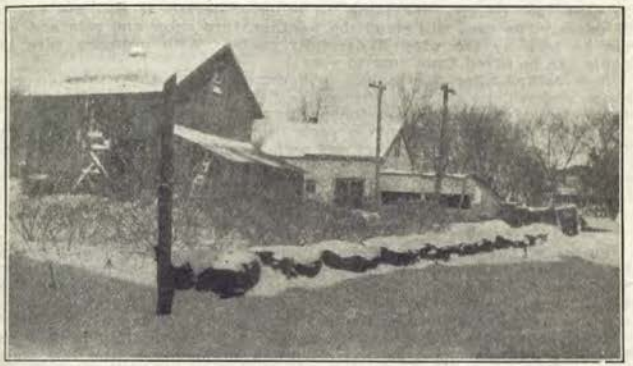
Wm. H. Elges, Dexter

That bees should be packed for winter is hardly an open question. Close observation and practical results have proved beyond doubt that

Colonies on summer location

sufficient packing results in stronger colonies and larger crops of honey. The real problem before beekeepers is to decide the most economical as well as the most practical method of packing. The Iowa Packing case and the quadruple cases are both good but when we consider convenience and cost the tar paper case is bound to prove more and more acceptable.

In preparing bees for winter we should see that all colonies are strong, and have vigorous young queens. Weak and queenless colonies should of course be united. That they should have abundance of stores goes without saying. It is my own practice to winter in two full depth hive bodies. No doubt one hive body would be sufficient if it was full of honey. I have often wondered if it would not be a good plan to remove the bottom hive body the last thing before packing, shaking all bees into the one body. While this would reduce the amount of space that the bees would be required to keep warm it would scarcely leave room for them to cluster. Furthermore we all know how difficult it is to handle bees late in the fall. All my bees are at present in two full



Colonies wintering in tar paper cases

depth hive bodies and it gives one a feeing of security about the middle of May to see them just coming into the top story.

If one is to follow this method of wintering, the first step is to arrange the colonies in groups of two. This should be done in the summer or early fall. They should be raised four to six inches from the ground.

The materials required are as follows: Tar or asphalt paper 36 inches wide, (32 inch paper will do in a pinch but is not as good especially for the top. One 50 pound roll of 400 square feet will make eight cases packing 16 ten frame hives: laths, pieces 16x⅞x2, wire cloth ¼ inch mesh, binding twine, saw, hammer, small staples and nails, plenty of straw, chaff, leaves or shavings.

Cut wire cloth 14½ inches long and one inch wide, place this over the entrance to keep out mice. A mouse will go through a ⅜ inch opening. Nail your ⅞ inch piece above the entrance holding the wire cloth in place, providing a tunnel into the hive. Pack insulating material under the hives. Now drive one small staple into the rear of each bottom board about the middle and two in the edges of the bottom board to the outside. Cut pieces of binding twine into pieces about five feet long and tie into these staples.

Cut your paper into pieces 11 feet, 8 inches long for the sides and 4 feet long for the tops. Fasten the ends together by nailing between two pieces of lath 28 inches long, leaving 6 inches at the top for folding in. Put the paper in place and fasten to the tunnel using 2 pieces of laths 16 inches long to keep the paper from tearing and at the same time holding it in place. Drive another small staple into the middle of these laths and fasten another string 5 feet long.

Now you are ready for the packing. Leaves or chaff are excellent if they can be secured. But for 100 colonies or more straw is quite satisfactory. One big load will be sufficient. Oat straw is better than wheat straw. Pack the straw in close around the hives beginning at the corners. If you do not begin at the corner you will find no room left there for packing. Fill packing case to the top heaping it up in the middle. After folding in the sides put your top in place and tie. Two men can do this much better than one. However, if there is only one, pieces of stone may be used to hold the folds in place until top is made secure. Do not forget to make an opening into the tunnel.

When all materials are ready two men can pack 40 colonies in a day. The cost for paper if it can be secured for $3.00 a roll is less than 20 cents per colony. Including all other materials it will not exceed 25 cents. The case will stand the weather, turn snow and rain and will not be torn by the wind if carefully made. With ordinary care the paper can be saved from year to year.

Bees packed after this fashion will come through the winter in good shape and will be twice as strong, the first of June as colonies without protection. I do not remove the packing until after the 10th of May.

It is much more pleasant to pack bees on a beautiful October day than on a cold day in November and earlier packing is better for the bees.

HOW BEES CONCENTRATE NECTAR*

O. W. Park, Ames, Iowa

Nectar of flowers becomes honey only after it has been gathered by bees and has undergone certain chemical and physical changes for which the bees are responsible. When these changes have been completed the honey is said to be ripe. An important part of the ripening process is the elimination of a large part of the water content of nectar.

The two theories that have been offered in explanation of how the honeybee reduces the high water content of nectar to the low water content of honey, are known as the *excretion* and the *evaporation* theories. The first of these is based largely upon the well known observation that bees carrying thin nectar or thin syrup often eject a tiny spray of colorless liquid. As early as 1878, Rauschenfels (1) and others assumed that this was the result of a process within the body of the bee whereby some of the excess water was eliminated from the nectar while the bee was en route to the hive.

De Planta (2), at about the same time, arrived at a similar conclusion from the results he obtained from the analysis of nectar, new honey and old honey, in which he found that honey newly deposited in the cells reached them already considerably concentrated.

Thompson (3) and A. I. Root (4) collected and tasted some of this spray. Both reported it to be tasteless and as far as they could tell was only water.

The Excretion Theory

Brunnich (5, 6, 7) has developed an interesting theory in which he states that the membraneous wall of the honey-sac allows water to pass through it into the blood of the bee, from whence it is removed by the rectal glands and discharged by them into the rectum.

*The writer desires to express his sincere appreciation of the hearty co-operation given by the Department of Chemistry of Iowa State College. Special thanks are due Dr. R. M. Hixon, Plant Chemist, for his valuable assistance and guidance in the analysis of nectar.

If the excretion theory is valid, an analysis of the nectar taken from the honey-sac of a bee entering the hive with its load should show a greater concentration of sugar than would nectar taken directly from the plants from which the bee obtained its load. A number of analyses of this character were made during the past summer on nectar from two different sources. Analyses were run in duplicate in practically all cases in order to guard against errors.

The first plant used was the common milkweed (*Asclepias syriaca*). Analyses were made of eight samples of nectar taken directly from the flowers and seven from the honey-sac contents of milkweed nectar-carriers caught as they were entering the hive. These analyses showed decisively that the nectar taken from the honey-sac of the returning field-bee was not more concentrated than that taken directly from the flowers. As a matter of fact, the average found for the concentration of sugar in the nectar taken from the bees was eight per cent lower than that for the nectar taken directly from the flowers. This decrease in concentration appeared as a rather constant factor and in only one case did the honey-sac contents show a higher concentration than the average for nectar from the flowers themselves. One such exception is not more than should be expected in an experiment of this nature in which the bees caught at the hive may have secured their loads from a group of milkweed plants other than that from which the nectar was gathered by the experimenter.

The second source of nectar used in these experiments was the gladiolus (*Gladiolus* sp.). This plant yielded nectar in quantities that could be collected and fed to the bees, thus eliminating the factor suggested in the preceding paragraph as a possible source of error. Field-going bees were used. Each bee was marked, placed in a queen-nursery cage, and kept there without food for an hour. A single large drop of nectar was then placed on the screen of each cage. Only those bees which took up a large drop were used further, thus insuring that every bee used had a full load of the nectar provided for it, and that it had none from other sources. These bees were then released at a distance of one-half mile from the hive and were captured when they returned to the hive. The nectar was then recovered after having remained within their honey-sacs for approximately one hour. Analyses were run on the nectar recovered from the bees, as well as upon a sample of the nectar as it was obtained from the flowers.

The following day, the experiment was repeated, only in this case a harmless coloring material was added to the nectar before it was fed to the bees, so that not only were the bees marked but the nectar itself was marked also. Hence it would have been impossible for one of those bees to get rid of the load it was given and acquire another from a different source before returning to the hive, without being detected. The nectar was analyzed both before and after the coloring was added, and again after it was recovered from the bees. The results of this experiment were almost identical with those obtained the previous day when uncolored nectar was used. In both of these cases the concentration of sugar was about one per cent less in the nectar taken from the bees than it was before being fed to them.

Several questions arise. Why was the decrease in concentration so much greater in the case of milkweed nectar than in the case of gladiolus nectar? As suggested above, the bees caught at the hive might have been working on a group of plants other than that from which the experimenter collected his sample. It is possible also that some few of the bees used may have carried loads from plants other than milkweed, although every one of the bees used bore the pollinia of the milkweed, clipped onto her feet and legs. The writer's earlier researches on the habits of field-bees (8) indicated that a bee seldom changed from one kind of flower to another in her gathering until her particular kind was no longer available. It is unlikely, then, that this factor would enter in until towards the end of the blooming period, but the analyses showed marked uniformity throughout the whole period.

Another possible cause of this difference in results from the two different sources is the fact that in the case of the gladiolus, the nectar was quickly obtained by the operator in considerable quantities whereas, in the case of the milkweed, the process of collecting a sample from the flowers was very much slower, and smaller quantities were obtained, so that there was greater aeration of the milkweed nectar. A loss of water by evaporation would tend to increase the concentration of the nectar. This factor probably is responsible for some part of the apparent difference but that it could account for all of it seems to the writer improbable.

But the explanation which to the author seems most plausible is that the milkweed nectar was twice as rich in sugar, as was that from the gladiolus. So in order to bring about proper conditions for rapid inversion of the sugar, it was necessary for the bees to add a greater quantity of the enzyme to the more concentrated solution, thereby reducing its concentration to a greater extent than was necessary in the case of the more dilute nectar from gladiolus. It is well known in regard to the inversion process, that the more concentrated the solution, the slower the action.

Are we, then, to conclude that a dilution instead of a concentration process goes on in the honey-sac between the flower and the hive entrance? The data at hand are not considered sufficient to warrant such a conclusion. They are ample, however, to show that no concentration occurs between the flower and the hive. Moreover, they certainly suggest that some dilution may occur.

What, then, is the source of the droplets of clear liquid ejected by bees when carrying thin nectar or syrup? As yet no direct experiment has been carried out to determine this point, but methods have been worked out by means of which it is hoped the answer may be secured during the coming season.

Concentration by Evaporation

If we consider the excretion theory disproven, the only remaining explanation that has been offered as to how bees concentrate nectar is that of evaporation. Does this method adequately account for the actual rate of concentration? Brunnich (7) believes it does not, and cites the work of Huillon as well as some experiments of his own. During a good honeyflow, Huillon took away all the combs from three colonies one evening and the following morning gave them empty combs. From colony 1, he removed these combs in the evening of the same day. From colony 2, the combs were removed the next morning. Colony 3 was placed in the cellar on the evening of the first day and was left there three days, after which the combs were removed. After being extracted, the specific gravity of the three samples thus obtained was found to be: 1.394, 1.415 and 1.432 for colonies 1, 2 and 3 respectively. These densities, according to Brunnich, correspond respectively to 26, 22 and 17 per cent water. Brunnich concludes that, since ripe honey often contains as much as 20 per cent water, these results would indicate that the samples from colonies 2 and 3 were both practically ripe so far as water reduction was concerned, and that the sample from colony 1 had been reduced in water content to a much greater extent than could be accounted for by evaporation from the nectar while stored in the cells. According to my figures, the densities given above correspond respectively to 23, 20 and 17 per cent water instead of 26, 22 and 17. Thus, it will be seen that even the sample from Colony 1, which was taken on the evening of the first day, had reached practically the concentration of ripe honey. Is all of this concentration to be accounted for by evaporation during the course of 10 or 12 hours? Probably not.

Apparently it was assumed that these samples were composed entirely of nectar gathered during that one day. It is extremely improbable that such was the case. More or less honey was undoubtedly present in the honey-sacs of the bees when the combs were taken away, the amount

depending upon the degree of disturbance incident to the removal of the combs. Even with no disturbance, which is impossible, there must have been several thousand nurse bees elaborating food for the brood and on that account well supplied with honey. It appears unlikely, therefore, that such a colony, suddenly deprived of its brood, would consume during one night anywhere near all the honey carried over in the honey-sacs. Then, when given only empty combs (no brood) and with fresh nectar coming in, the nectar and the unused ripe honey would undoubtedly be deposited in the combs together; and who can tell in what proportions? Obviously, Hullion's experiment was of such an indefinite character that his results can throw but little, if any, light on the question as to the method or methods employed by bees in concentrating nectar.

In a somewhat similar experiment, Brunnich determined the density of the "fresh honey" of two combs taken from different hives, and after protecting them with wire-cloth so that no bee could touch them, he hung them in a strong colony where they were left during a period of eleven days of fine weather. During this period their respective densities changed from 1.342 to 1.360 and from 1.288 to 1.340. The former then advanced in concentration of sugar from 69 to 72 per cent, and the latter from 60 to 68 per cent. In both cases the so-called "fresh honey" was quite concentrated when the experiment was begun and therefore would lose moisture only slowly by evaporation from the cells. Moreover, the humidity may have been high during the period. Such an experiment is no proof that rapid concentration of nectar cannot be accounted for by evaporation. Had the experimenter used combs containing fresh nectar only, he would have obtained vastly different results.

From the mathematical calculations which he presents in an attempt to show that evaporation alone could not account for the observed rate of concentration of nectar during a heavy honey-flow, Brunnich appears to be unaware of certain details of the handling of nectar by the house-bees. He assumes that when nectar is being carried around by a house-bee, it is being concentrated by the so-called excretion process. But, with proper facilities, any close observer can see that such a bee is constantly manipulating its load in a manner which provides most favorable conditions for rapid evaporation. Thus the concentration which he here attributes to the process of excretion alone, is shown to be due, at least in part and perhaps altogether, to a phase of evaporation.

In his final experiment, Brunnich fed a 43 per cent sugar solution to two colonies shaken onto empty combs in late fall when no nectar was available in the field. For the first colony, the syrup was colored red with eosin; for the second, a known percentage of sodium hyposulfite was added. The feeding was continued for a week, at the end of which time a sample was taken from the combs of each hive. The density was then found to be 1.340 for the first and 1.370 for the second. This indicates that the concentration had been raised from 43 per cent to 68 and 73 per cent respectively. They had been reduced in volume to almost one-half of the original. By comparing the sample with the original, he found that the color intensity had not increased at all; and by chemical analysis he found that the hyposulfite had increased only 9 per cent.

Brunnich's reasoning was that, had the increase in concentration been due to evaporation, the thickened food should have been about twice as deep in color as the original, in the first case; and that in the second case, it should have contained about twice as great a percentage of hyposulfite as did the original syrup. That seems logical. But on the other hand, assuming for the moment that water was removed by some physiological process, why should it be expected that either the coloring matter or the chemical substance would be eliminated with the water any more than that it would remain with the sugar? It was not shown that any coloring matter or any hyposulfite was excreted by the bees. It was merely assumed that such was the case. Further and more conclusive

experiments will need to be performed before the excretion theory can be accepted.

It remains to be shown whether evaporation can and does proceed at a rate sufficient to account for the observed facts. Evaporation of nectar is known to have two phases: evaporation from the tongue of the house-bee, and from the cells of the comb. The first mentioned phase has been discussed by the writer in previous articles (9, 10), so it will be necessary only to remind the reader that during the manipulation of the nectar by the mouthparts of the house-bee, a most excellent opportunity for rapid evaporation is provided. It is not known whether the nectar is handled in this manner more than once, but if it is this would account for a very rapid rate of evaporation. While the extent to which nectar is concentrated by this means is yet definitely known, there are reasons to believe that it may be the most important single factor in the concentration process.

Evaporation from the cells of the comb also presents two phases: evaporation from hanging drops of thin nectar, and evaporation from the new honey after being placed in the cell in the usual manner. Here again the writer has already shown, in the articles referred to in the preceding paragraph, that when nectar is being brought in more rapidly than it can be taken care of in the usual way, the house-bee does not stop to manipulate each load as received but "hangs it up to dry." A tiny droplet is hung in the roof of each of several empty or partly empty cells, which frequently are occupied by eggs or young brood. These small hanging drops present relatively large surfaces from which moisture can escape rapidly. Later the droplets are collected and it is assumed they are then put through the usual process of manipulation by the mouthparts. This phase of evaporation must be of considerable importance at times of heavy yields, especially when the nectar is very thin.

Evaporation From the Cells

So far we have been dealing with phases of evaporation, the importance of which seems apparent, but a measure of their importance is not readily established. It was found feasible, however, to obtain valuable data on the rate of evaporation from nectar located in its usual position in the cells. The experiment follows.

Glass cells, having the same diameter and depth as worker cells, were prepared. A frame was made having sockets to receive and hold them in the position of the cells in a comb. The cells were thoroughly cleaned, dried in the oven, and carefully weighed on chemical balances. Nectar freshly collected from gladiolus was placed in the cells and the amounts accurately determined by weighing. The cells were then fitted into their sockets and the whole frame was enclosed in a wire screen cage which allowed the entire apparatus to be hung in a normal colony next to a frame of brood. No bee could reach these cells, but the warmth of the hive and the currents of air were free to play their parts.

It was expected that the amount of nectar in the cell would influence the rate of evaporation, so three sets of cells were used, one set had only one drop at the back of each cell, the second set was filled about one-fourth full, and the third nearly three-fourths full. At the end of 24 hours, some of the cells of each set were removed, their loss in weight, and their sugar content determined. Whenever analyses showed less sugar than had been found in the nectar when first gathered, it was considered that fermentation had set in and the results were treated accordingly. But so long as no sugar was lost, the losses in weight were considered to be due to evaporation alone. At the end of the second day, another lot of cells was removed and treated in a like manner, and so on for a period of seven days.

For the sake of simplicity, let us discuss the results of this experiment in terms of concentration, keeping in mind the fact that

ripe honey has a concentration of about 80 per cent. For convenience let A, B and C represent the three groups of cells, group A having the least and C the most nectar. The results for groups A and B were so nearly identical that the figures for group B only will be mentioned. The nectar when first collected, contained 13.5 per cent sugar. Briefly stated, the concentration for group B actually rose to 79.5 per cent or that of ripe honey during the first 24 hours. During the next six days there was comparatively little change.

The results for group C must be qualified because fermentation set in before the end of the first day. The amount of sugar lost in this way was so slight, however, that considerable light was thrown on the rate of concentration in cells nearly filled with thin nectar. If we assume, in this case, that all loss in weight was due to evaporation, then the nectar in the cells of group C advanced in concentration to 30 per cent the first day. That is, it only a little more than doubled its original concentration whereas, the nectar in groups A and B increased its concentration six-fold in the same length of time. Had there been no fermentation the actual rate of concentration for group C would have been a little lower than that indicated above. Hence the expectation was borne out that, within certain limits, the larger the amount in a cell the more slowly evaporation takes place. (A large amount of available comb space must greatly facilitate the concentration of nectar.) After the first day, fermentation progressed so rapidly in group C that further results were not usable.

Other experiments along this line were performed but space does not permit a description of them here. Without exception they all showed a very marked loss by evaporation during the first day, often a moderate loss the second day, and sometimes a small loss the third and fourth days. The rate of loss was found to depend principally upon three factors: the relative humidity of the atmosphere, the amount of nectar in the cell, and the initial concentration of the nectar. The higher the initial concentration, the more slowly did it lose water.

The results of further experiments are needed before drawing ironclad conclusions, and further work along these lines is contemplated. The present paper if offered only as a preliminary report, but it is believed the experiments related above are sufficient to show, beyond any reasonable doubt, that evaporation from nectar in the cells can account for a very large part of the concentration process. It is the author's belief, however, that the evaporation which takes place from the mouthparts of the house-bee may be of equal importance; and that evaporation in its several phases can fully account for the observed rate of nectar concentration.

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CONTROLLED MATING OF QUEEN BEES ESTABLISHED ON A WORKABLE BASIS

By G. H. Cale, Hamilton

Students of the history of beekeeping know that many claims have been made by over-enthusiastic workers that they had found a way to control the mating of queen bees but none of these claims have been verified. There are probably only two or three reported instances where the experiments were of any value.

In the Journal of Experimental Zoology, Vol. 31, No. 2, George H. Bishop gives two extended papers on fertilization in the honeybee, the facts of which were developed from a series of unsuccessful attempts to fertilize queens artificially. This is the most exhaustive account which has so far appeared on the morphology and physiology of mating in the honeybee.

In commenting on his attempts at controlled mating, Bishop reports entire failure. He used two methods. In one, he forced extrusion of the drone's organs under pressure into the queen, held in juxtaposition. Secondly, he dissected out the fluid of the drone and injected it with a pipette into the organs of the queen.

George D. Shafer, in Technical Bulletin 34, of the Michigan Agricultural Experiment Station, gives a study of the "Factors which Govern Mating in the Honeybee." He tried two ways of bringing the queen and drone together. Each bee was fastened at the end of a fine elastic wire halter, and then allowed to fly, the halter giving such freedom as would permit flight and still the operator could govern their movements enough to keep them together, face to face. No matings were secured although the drones often clutched the queens. By the other method the operator tried to evaginate the male organ into the vagina of the queen by bringing the insects together, inserting the tip of the drone's abdomen into the queen and causing expulsion by pressure of the thumb and finger. No matings were obtained by this method either.

Among earlier investigators, N. W. McLain seems to have been ably prepared for his work. In the American Bee Journal, 1888, page 487, McLain gives a report of an experiment in controlled mating in a large cage. Queens and drones appeared to fly in this cage with freedom and he observed several cases where the queens and drones embraced but they quickly separated. Of many scores of trials, he claims that six were successful. Lack of further results is blamed to the impotency of the drones which he believes due to unfavorable climatic conditions.

Again in the same Journal, Vol. 23, 1887, McLain reports securing one mating out of six, and later three out of six among bees similarly confined in an enclosure. Others have reported matings in still closer confinement under glass or cloth covered compartments with freedom for flight allowed each day.

Shurk, in the American Bee Journal for 1882, page 789, reports looping a thread ten feet long about the waist of a queen and attaching it to an eight foot pole. He says in less than a minute, several drones were pursuing the queen and finally one of them caught her and mating occurred. From his experience, he discredits the success claimed for mating in boxes, tents, or similar devices.

McLain, (American Bee Journal, 1887, page 567), gives a lengthy report of a careful experiment in controlled mating in which the queen was clamped to a mating stage, the male sperm removed from the drone and injected into the vulva of the queen. Of twenty-seven queens thus treated, he reports six as successful. He expressed regret, however, that, although he was persistent in his efforts, he only met with success occasionally.

It is quite probable that McLain did secure results but it is also highly probable that his matings were all partial. His article, "Controlled Fecundation in Queens," is well worth reading.

Jager and Howard, in Science, N. S., No. 1037, page 720, report succeeding in controlling the mating of one queen. In his Michigan Bulletin, Shafer gives 25 references to mating experiments on the part of 17 different investigators. Many other reports have been made that were probably entirely without foundation.

It now seems quite certain, however, that one of our most recent investigators in this subject, Lloyd R. Watson, of Alfred, New York, U. S. A., has succeeded in developing a method of controlled mating which is proving quite continuously successful in his hands. The writer has followed Mr. Watson's work for several years with considerable interest and much in detail.

He is well trained for the problem, especially in the sciences, particularly chemistry, organic and optical, insect anatomy, biometry, microscopy, biology, genetics, and laboratory methods. It has always been in the back of his mind that, when he had opportunity he would study artificial insemination.

Mr. Watson is a graduate of Alfred University, New York State, where he became a teacher of chemistry for seven years, later branching off into beekeeping work in Connecticut Agricultural College, at Storrs, Connecticut. From there, he went to the Bee Culture Laboratory, at Washington, D. C., and was State Apiculturist of Texas for one year, finally returning to Cornell University, where, for the past three years, he has been pursuing graduate study for a Doctor's Degree in Genetics in the Department of Plant Breeding, under Dr. R. A. Emerson.

Any attempt to do creditable work in the field of genetics with the honeybee requires some means of controlling mating and this immediately brought him up against the old problem which has baffled so many investigators. He did not hesitate to push his way into it at once.

I visited Mr. Watson in Alfred last year to learn, if I could, the possibility of his securing results from his experiments. It was my opinion that he would succeed although most of his scientific colleagues offered him no particular support and were practically all of the opinion that he had undertaken a task in which he would have little chance of success.

Since I have known Mr. Watson for a decade and knew the unusual quality of his technical skill, I left his laboratory with confidence that he would solve the problem of controlled mating. His methods and technique have been developed so thoroughly that he is meeting with unexpected success. Although he showed me fully all the details of his apparatus and procedure it is not possible to give them out until the publication of the thesis for his Doctor's Degree at Cornell University, which will describe the whole process in complete detail.

On October 5, 1926, before an examining committee of Cornell University, Mr. Watson gave a complete and acceptable demonstration of his methods and apparatus and his results. He gives a delightful account of this occasion in a letter to the writer, from which the following quotations are taken:

"A day or two after sending you my last letter, I heard from Dr. Emerson of my examining committee advising me that as soon as I had a generation of hybrid bees by my method, he would like to have a demonstration of the technique before him and other members of the faculty. At the very time I received this letter, I had the desired generation of hybrid bees emerging. In view of the lateness of the season and of the fact that in many of the hives of the yard, the bees were actually pulling out sealed brood. On Monday the 4th, I wired him that I would be at his office on Tuesday morning, the 5th, for the demonstration.

"The demonstration had been arranged for 10 o'clock on Tuesday and as soon as the building was open at eight, Huber and I were there to begin the task of setting things up and getting every item in perfect readiness. When the appointed hour struck, our preparations were complete with queens, drones, and artificial hybrids, arranged in order and ready for whatever might come.

"There were quite a number of people present besides the immediate

faculty, under whom I have worked for three years. The finest of spirit pervaded the whole period which lasted nearly two hours, I am glad that all the entomologists were there for, in spite of the fact that they watched closely and questioned me profusely, I seemed able to satisfy them on every point. At the end of the two hours, I asked if there was any part of the work that anyone would like to see repeated and Dr. Emerson, (my Professor in the Department of Genetics), rose saying he believed he voiced the sentiments of everyone present that the demonstration had been so clear and convincing at every step that there was nothing further to be desired. It all seems like a dream to me."

Although Mr. Watson's method is remarkably successful, he declares that it needs refinement before any large percentage of the queens subjected to treatment will be as perfectly mated as they could be by natural means. However, the progress made so far is an agreeable surprise. In writing of his work during the past season, he says, in one report:

"One artificially inseminated queen is laying beautifully and her first brood is just now being sealed with the normal flat cappings of worker brood. Another queen, a sister of the former, has been laying vigorously for two weeks, but the cool weather and a dearth of nectar have caused the attendant bees to destroy her brood as fast as she produced it. A post mortem examination of her spermatheca reveals the fact that she had been partially inseminated. Under post mortem, a third sister showed an abundantly normal insemination. A fourth sister, treated on the same day and by the same technique, showed partial insemination.

"Other queens, treated on other days, are behaving normally and look promising but it is too early to know what the results will be. Day before yesterday, I treated nine virgins. Today I sacrificed three of them, and in all cases, I found a condition of partial insemination. Yesterday, I treated eight virgins, and today I dissected four of them and found a condition of partial insemination in three and in the fourth a copious supply of normally active sperm."

A later report says that fully normal hybrid workers resulted from the laying queens.

Most of this work has been done at Mr. Watson's home apiary since he has been a beekeeper for a long time and it was possible to assemble his materials here to better advantage than at the University. Permission for this non-resident work was secured from Dr. Emerson, of Cornell.

There is a wide interval between Mr. Watson's experimental work and the queen breeder's apiary but, with this initial success established and with a continuation of the work, we have the assurance that some of the problems in breeding and race improvement will yield more easily to solution.

OUR HIGHWAYS AND RAILWAY RIGHT-OF-WAYS FOR BEE PASTURAGE

By L. H. Pammel, Ames, Iowa

I need not say in this connection that the reason I am choosing this subject is because I am intensely interested in the preservation of our native flora. I have said repeatedly that the prairie of Iowa produced as fine a type of flowers as could be produced anywhere in the United States. The passing of this flora is keenly felt by all lovers of nature.

Naturally those of a practical turn of mind desire to know whether these flowers have any practical use, except to gratify our tastes for the beautiful. I do feel strongly that we should try to displace the weeds with plants that have some economic use.

Mr. Wm. A. Reed, Editor of the Waterloo Tribune, Waterloo, Iowa, suggests that our right-of-ways be made beautiful by the planting of the prairie plants. This fits in with the program that I am suggesting for using these highways for native honey plants and I am, therefore, reproducing the editorial, dated September 9, 1926:

"Few people have heard of the state board of conservation; few are interested in the state board. The board doesn't get into the press often. The press would welcome more material. The press could help the board in its work.

"Dr. L. H. Pammel, president of the board, has long lamented the passing of Iowa prairie plant life. Early settlers claim Iowa used to be a mass of bloom. But the prairie is now used for other purposes. With practically all Iowa under cultivation, native flowers have disappeared.

"The only place Dr. Pammel finds them now is along the right-of-ways of some railroads. In some parts of the state there are miles and miles of them, all growing under difficulties and expecting to be cut down before the blooms have a chance to appear, by the maintenance of way workers.

"The doctor has persuaded the Wabash officials to reserve parts of their right-of-way for plant life. On the property of this railroad in southern Iowa native flowers and plant life have been blooming and growing through the years. About all the old Iowa favorites maintain their dignity—under handicap it is true, but maintain it fairly well.

"Along the Wabash tracks the doctor has observed the cup plant, mixed, in some instances, with horse mint or bergamot; there are iron weeds and artichoke; blue stem asters and golden rod, wild rye, wood thistle, terrell and in some places the reddish blazing star and partridge pea.

"Worth preserving? Yes. How much more pleasant a railroad journey through Iowa. How soft on the eye. What a change in landscape.

"And why not Iowa beautify the sides of its paved roads? Why not an automobile trip across Iowa made more pleasant by presentation to the traveler of Iowa's native plant life with its mixture of color? Why weeds and noxious growths lining the highways?

"What a picture and at cost little or nothing."

Recently the Wabash Railroad established some preserves along the right-of-way of its railway between Des Moines and Moulton, Iowa. Many of the plants thus preserved are most excellent honey plants and will furnish much bee pasturage. The meadow sunflower, cup plant and horse mint should replace such weeds as the small and large ragweed. At the present time white and yellow sweet clover along highways and right-of-ways of railways furnish a large amount of nectar.

How should our highways be treated? When these are completed, that is gravelled or hard surfaced, there will be considerable space between the highway and fences. To begin with when ditches, cuts and fills have been made naturally many weeds will first appear. However, in a few years these vacant places, if properly treated, will be occupied by a type of plant, not only ornamental but useful for bees. In some cases the low places next to fences can be made to grow our native American plum or some of the numerous species of red haw, Washington thorn, choke cherry, elderberry, wild grape, Virginia creeper. We should, however, bear in mind that our planting should be of such a nature that our shrubs and small trees should be of the native type and should fit in with the landscape.

The steep banks in cuts can be utilized for growing many fine and valuable honey plants. If the cut is in the prairie sections of the state then we should use such type as our native prairie rose which will soon occupy the vacant spots and help to hold the soil. Another useful plant, the lead plant is not only a beautiful shrub when in flower, but a fine honey plant. Another prairie plant is the New Jersey tea and in places another closely allied species.

There are a large number of ornamental native herbaceous plants which are also valuable honey plants that can be used in such places. Their growth should be encouraged. Plants that may be used here are purple cone flower, Missouri goldenrod, ox-eye, horse mint, prairie cone flower, blue aster, tick trefoil, wild bean, coreopsis, pleurisy root one of the best of our honey plants, whorled milkweed, prairie lobelia, Culver's root another one of our best honey plants, Canadian lettuce,

compass plant, southern compass plant, sunflowers, prairie clovers. The above are some of the types of plants adapted to cuts of the prairies.

In sandy cuts the following plants should be used, wild bergamot a fine honey plant, the common partridge pea, white flowering spurge, black-eyed Susan, sumach, south-eastern Iowa the fragrant sumach, New Jersey tea, coreopsis, and fragrant goldenrod.

What types of plants may be used on the steep hills and lowlands adjacent thereto to prevent erosion and be of service to the beekeepers? Golden glow, a most excellent honey plant is much visited by honey bees, cup plant, artichoke and wild rose are common in southeastern Iowa. In many places the wild grape yields both pollen and nectar, the meadow rue furnishes a large amount of pollen, and Virgin's bower furnishes some nectar. Where these cuts and fills occur in timberland areas, the following plants occur and should be used to prevent erosion and serve as bee pasturage. In southern Iowa buck brush is one of the best of our fall blooming honey plants. American bell flower, artichoke, iron weed, golden glow, partridge pea, cup plant are other plants. On slopes in upland woods are found several tick trefoils, prairie clovers, narrow-leaved pennyroyal, hairy pennyroyal, partridge pea, goldenrod, asters, pennyroyal, blephilia, giant hyssop, southern compass plant, wild rose, ox-eye, blue aster, white aster.

In western Iowa along the Missouri especially the loess bluff region, a somewhat different type of honey plants occurs along the highways and should be made use of to cover the hill slopes, cuts and fills. The important honey plants are the blue sage, lettuce, anemone, goldenrods, asters, Kuhnia, sunflowers, prairie cone flower, blazing star. Two very important honey plants are Gaura and G. parviflora.

The bluff flora is essentially the same from Hamburg to Sioux City and north to Lyon county. The soil here is excellently adapted to alfalfa and two species of sweet clover which furnish most of the honey. The highways of the Missouri bottom furnish an entirely different flora. There are great quantities of the Maximilian sunflower which grows readily in this rich alluvial soil, meadow goldenrod, blazing stars, white asters, blue aster, snow-on-the-mountain, Canadian lettuce, blue lettuce, Canadian anemone and meadow rue. On sandy dunes, partridge pea, wild bean and butterfly pea.

In my studies of honey plants I have always found a large number of honey bees on the prairie plants found along the right-of-way of railways. The wild flowers furnish a honey flow from spring until autumn. The more important of these honey plants found are given in the following paragraph.

The following account is based on some observations made a few years ago. A year or so ago the writer viewed with interest the prairie flowers of the Missouri loess from Glenwood to Hawarden; the beard tongue, puccoons and yuccas. Then again the prairie marshes of western Iowa with their blue flag, and calomel, acres of it, the sweet william and many other plants. We were impressed with the ever beautiful hills. Some hours later, between Waterloo and Dyersville, especially east of Independence, we saw a galaxy of these glorious prairie flowers; the pink blossomed sweet william, solid masses, which any passenger on the train could recognize, and where the soil was sandy the bluish and purple spider wort evanescent in its bloom. The morning sunshine on these blossoms made a great impression. There was the wood betony and now and then the orange and yellow puccoon. Here and there, in large clusters, was the alum root, with its orange stamens, the yellow ragwort and underneath the blue-eyed grass, and here and there among the sweet williams that lovely prairie flower, the shooting star, sometimes in solid patches. Then there was the pale colored beard-tongue and out there next to the fence the wild indigo, with clusters of yellow flowers from 6 to 8 inches long; solid masses of the large New Jersey tea. On the banks were great masses of the Iowa prairie rose, that lovely spring flower. The fine thing about the prairie bloom is its every-changing character; now the black-eyed Susan, the ox-eye and pennyroyal

and meadow rue are in their glory, the purple cone-flower, later the lily, sunflower, golden rod and aster.

The prairie was the most distinctive part of Iowa. Nearly all of it is gone forever. We shall not regret this because it is the most fertile agricultural land in the world. Where once occurred the blazing star, golden rod, aster, gentian, lily and orchid, are fertile fields devoted to corn and oats and blue grass pasture. It is well however, that some of these prairies be preserved for future generations, that posterity may know what a prairie is like. Prairies are not all the same. The Iowa drift sheet had one type, the Wisconsin another, and the Kansan another. Mrs. Caroline Roberts, of Strawberry Point has a little prairie tract southeast of Strawberry Point not far from the Delaware-Clayton county line where many of these flowers occur. When the writer was there there were hundreds of the wild Turk's-cap lily, the Missouri golden-rod, early blue aster, purple loosestrife, blazing star, meadow rue, and Culver's root in bloom and later the New England aster, the willow aster and meadow golden-rod, great masses of the meadow sunflower, and gentian in great abundance. The writer observed nine species of willow in the bog and area adjacent to it, as follows: Beaked willow, pussy willow, sandbar willow, almond leaved willow, black willow, bog willow, dwarf gray willow, shining willow, sage willow, all good honey plants.

It was the writer's pleasure recently to study a small typical prairie in the Kansan drift sheet near Osceola in Clarke county. On this ten-acre tract there were great masses of tall bluestems such as the pioneers saw in great abundance on all of the upland prairies of the state; in thinner soil the bushy bluestem; on the borders of the tract Indian beard grass. There was an abundance of the white prairie clover and the purple prairie clover, horse mint, purple loosestrife, the ox-eye, the Missouri golden-rod, Culver's root, butterfly weed, mountain mint, greater lobelia, blue vervain, hoary vervain, Kuhnia, white aster, which were in full bloom in July and August. Also blazing stars, wild indigo and prairie lily. Early in the season there were windflower, lousewort, puccoon, sweet william, in blossom. In September there were great quantities of flowers in bloom of the following species: bush prairie clover, New England aster, smooth aster, blue rough aster, and the white willow aster, a blue gentian, large flowered golden-rod and others, and in dry, thin soil sunflowers and iron weed. The sterile ground was thickly covered with fragrant bunch grass, great tall slough grass. There were such weeds as field thistle, ragweed, on the borders and in dry places the perennial ragweed, sand wormwood, black-eyed Susan, cup plant, and Mexican dropseed grass. There were only a few shrubs, the New Jersey tea, and the prairie rose, and lead plant.

An interesting feature of this little prairie tract is that there may be found a few stretches of timber next to it.

A bit of prairie in Cherokee County is quite different in aspect than the prairie in the Kansan drift sheet. The former area is marked by numerous boulders of the Wisconsin drift sheet. One of them is adjacent to the Little Sioux River. The valley is covered with a fine growth of soft maple, black, almond and beaked willow, haws, plums, and a few wild crabs, all fine honey plants. The prairie hills are covered with a mantle of the Missouri loess. The soil is rather thin and the grasses are the bushy bluestem, Indian beard grass, dropseed grass; wild prairie rose, lead plants and New Jersey tea, buck brush are abundant and valuable as honey and pollen producers.

In the springtime these prairies abound in the pasque flower, wind flower, puccoon, birdfoot violet, and blue violet, lousewort, Culver's root, prairie wind flower and in low places meadow rue. For pollen, sweet william, butterfly-weed, bastard toad flax are in bloom, and a little later Missouri goldenrod, fragrant goldenrod, western sunflower, meadow sunflower, perennial ragweed. Good for pollen, black-eyed Susan, coreopsis, white and purple prairie clover, blazing stars of which there are three

species on these prairies—two belong to the eastern prairie type, and one is a typical plant of the plains of Nebraska.

When the writer was there in October the smooth blue aster, the silky aster and New England aster were still in bloom, making the prairie a beautiful sight to behold.

It was the writer's pleasure in a recent trip to Linn and Iowa counties over the C. & N. W. to find acres of the rose-red phlox or sweet william, of the prairies in bloom between Tama and Cedar Rapids. The sweet clover has, in some places, made an encroachment on the "wilderness" of the prairie. There were, growing with it, sweet golden alexander. The prairie rose, our state flower, was just coming into bloom, and there were a few belated bird-foot violets and orange puccoons all valuable for honey and pollen.

A little later the writer was on the M. & St. L. between Lake Mills and Grand Junction. Across Winnebago and Hancock counties the prairie flowers were slightly different in kind. There were great masses of the golden alexander, some of the prairie sweet william, and the prairie rose. There was much of the golden prairie ragwort or groundsel, not a few scattered plants, but solid patches, in some cases an eighth of an acre or more in extent. Now and then in low places, were the blue iris, blue flag or fleur-de-lis, a few belated blue-eyed grass, yellow star grass, the yellow puccoon, an occasional alum root, and the early false indigo with its long racemes of cream colored flowers gracefully bending to the ground.

Here and there is rich black prairie soil where are solid patches of the vetchling and everlasting pea, while the Carolina vetch, too is common along the railway prairies. Here and there on these prairies may be seen a lily-like plant with creamy greenish flowers related to the camas plant of the west. Everywhere on these gravel knolls there were many clumps of the needle grass so well known to the pioneers. The railways should establish preserves.

A dozen or more of these preserves have been established by the Wabash railroad. Most of these preserves are more than a mile long, and contain many interesting flowers. At the time of our inspection the large cup plant with its yellow flowers was very abundant, and there were also great quantities of the bergamot or horse mint, and in some places there were still patches of yellow prairie cone flowers in bloom and the ox-eye. The common artichoke was just coming into bloom, and there were many acres of two or three species of violet purple blazing stars. These blooming plants are certainly much prettier to see than the common weeds and at the same time they furnish bee pasturage. There is no question but that by establishing these preserves, which will permit these plants to go to seed, ultimately some of the dangerous common weeds which now menace the adjacent agricultural land will be displaced by these fine prairie flowers. The Wabash railroad is to be commended for the action it has taken in the establishment of these wild prairie preserves.

During the middle of July the writer made a trip over the Chicago, Milwaukee and St. Paul railway between Calmar and Cedar Rapids. There were long stretches of fine prairie flowers in bloom, a veritable flower garden. The bergamot, or horse mint, cup plant, the yellow prairie cone flower, the ox-eye, the early goldenrod, and two species of blazing star were just coming into bloom, and some whorled milkweed, and now and then in low ground some of the swamp milkweed. It was delightful to see so many fine flowers. The writer thought he would see what kind of reaction he would get from the train crew on the making of these areas into preserves; he therefore spoke to the brakeman as follows: "What a fine lot of wild prairie flowers on the right of way of the Milwaukee. Don't you think it would be nice to preserve these?" The comment was this, "They should all be cut off and burned, because the farmers will complain of the weeds coming from the right of way of the railroads." Then I remarked that there was absolutely no danger

of these prairie flowers becoming a menace to these farmers, because they seem to have difficulty in holding their own with the invading plants. I told him I thought it would be delightful to see these prairie flowers in bloom.

Just recently the writer crossed a part of Story County over the Chicago and Northwestern railroad, and about the same time had occasion to observe the prairie flowers along the right of way of the Rock Island in the vicinity of Des Moines. It is interesting to observe the succession of the prairie flowers. The Canadian goldenrod had practically passed the zenith of its flowering period and in its place we found the flat-topped and the large meadow goldenrod, on little gravel knolls the fragrant goldenrod, the white aster, and the smooth blue aster. The lavender bergamot or horse mint had been replaced by these late goldenrods, asters, and artichokes, and the meadow sunflowers. We also find the silky aster and the showy goldenrod as well as the western sunflower (Helianthus occidentalis). Some of the bonesets like Eupatorium altissimun and the Kuhnia eupatoridodes were in full bloom. What a beautiful plant the meadow sunflower is in early September, with long wands of flowering heads one or more feet in length.

The writer drove through a great deal of original prairie between Ames, Story county and Burnside, in Webster county, and Ogden, in Boone county. In all this area he saw only a very little of the original prairie left, here and there a flat or a few glacial prairie knolls. The highways which originally contained our prairie plants are now overgrown with weeds and in some place with sweet, alsike, white or red clover; now and then a purple coneflower or the prairie coneflower or the yellow ox-eye or the compass plant, with a little more tenacity, are able to persist. Of course, there will be the blue and white asters, as these plants have a little more tenacity of life than most of the prairie plants.

The Chicago and Northwestern railroad is willing to have some of these prairie spots on their right-of-way preserved for the delight of passengers, if the railroad is protected and tentative arrangements have been made. Let us hope some of our prairie may thus be preserved and at the same time more of the honey flora.

SCIENTIFIC NAMES OF PLANTS

American Plum—*Prunus americana.*
Almond Leaved Willow—*S. Amygdaloides.*
American Bell Flower—*Campanula americana.*
Asters—*Aster sagittifolius, A. Drummondii.*
Artichoke—*Helianthus grosseserratus.*
Anemone—*Anemone cylindrica.*
Blazing Star—*Liatris pycnostachya.*
Blue Aster—*Aster laevis.*
Butterfly Weed—*Asclepias tuberosa.*
Beaked Willow—*Salix rostrata.*
Black Willow—*S. nigra.*
Bog Willow—*S. pedicellaris.*
Bluestems—*Andropogon provincialis.*
Bushy Bluestem—*Andropogon scoparius.*
Blue Sage—*Salvia lancaefolia.*
Blue Lettuce—*Lactuca pulchella.*
Black Eyed Susan—*Rudbeckia hirta.*
Buck Brush—*Symphoricarpos orbiculatus.*
Blue Vervain—*Verbena hastata.*
Bush Prairie Clover—*Lespedeza capitata.*
Blue Rough Aster—*Aster azureus.*
Blue Gentian—*Gentiana puberula.*
Birdfoot Violet—*Viola pedata.*
Blue Violet—*Viola cucullata.*
Canadian Lettuce—*Lactuca canadensis.*
Compass Plant—*Silphium laciniatum.*
Common Partridge Pea—*Cassia chamaecrista.*
Coreapsis—*Coreopsis palmata.*
Cup Plant—*Silphium perfoliatum.*
Culver's Root—*Veronica Virginica.*
Choke Cherry—*Prunus Virginiana.*
Canadian Anemone—*Anemone canadensis.*
Carolina Vetch—*Vicia caroliniana.*
Dwarf Gray Willow—*Salix tristis.*
Elderberry—*Sambucus canadensis.*
Fragrant Sumach—*Rhus canadensis.*
Fragrant Goldenrod—*Solidago nemoralis.*
Fragrant Bunchgrass—*Sporobolus heterolepis.*
Field Thistle—*Cirsium discolor.*
Giant hyssop—*Agastache scrophulariaefolia.*
Goldenrod—*Solidago nemoralis and S. rigida, S. ulmifolia, S. canadensis.*
Gaura—*Gaura coccinea and G. parviflora.*
Greater Lobelia—*Lobelia syphilitica.*
Golden Glow—*Rudbeckia laciniata.*
Horse Mint—*Monarda mollis.*
Hairy Pennyroyal—*Pycnanthemum pilosum.*
Hoary Vervain—*Verbena stricta.*
Indian Beard Grass—*Sorghastrum nutans.*
Iron Weed—*Vernonica Baldwini.*
Kuhnia—*Kuhnia eupatorioides.*
Lousewort—*Pedicularis canadensis.*
Lead Plant—*Amorpha canescens.*
Missouri Goldenrod—*Solidago missouriensis.*
Meadow Rue—*Thalictrum purpurascens.*
Mexican Dropseed Grass—*Muhlenbergia mexicana.*
Mountain Mint—*Pycnanthemum virginianum.*
Maximilian Sunflower — *Helianthus Maximiliani.*
Meadow Goldenrod—*Solidago serotina.*
Narrow-leaved Pennyroyal — *Pycnanthemum flexuosum.*
New England Aster—*Aster novae-angliae.*
New Jersey Tea—*Ceanothus americanus, Ceanothus ovatus.*
Ox-eye—*Heliopsis scabra.*
Partridge Pea—*Cassia marylandica.*
Prairie Clovers—*Lespedeza striata; Lespedeza capitata.*
Pennyroyal — *Hedeoma pulegioides, Blephilia ciliata.*
Pussy Willow—*S. discolor.*
Purple Prairie Clover—*Petalostemum purpurum.*
Purple Loosestrife—*Lythrum alatum.*
Puccoon—*Lithospermum canescens.*
Perennial Ragweed—*Ambrosia psilostachya.*
Pasque Flower—*Anemone patens var Wolfgangiana.*
Pea—*Lathyrus ochroleucus.*
Prairie Rose—*Rosa pratincola.*
Purple Cone Flower—*Echinacea angustifolia.*
Pleurisy Root—*Asclepias tuberosa.*
Prairie Lobelia—*Lobelia spicata.*
Sweet William—*Phlox pilosa.*
Smooth Aster—*Aster laevis.*
Sunflowers—*Solidago nemoralis, Helianthus grosseserratus, Helianthus tuberosus.*
Slough Grass—*Spartina Michauziana.*
Sand Wormwood—*Artemisia ludoviciana.*
Southern Compass Plant—*Silphium integrifolium.*
Red Haw—*Crataegus mollis, C. coccinea, C. tomentosa.*
Ragweeds—*Ambrosia trifida, A. artemisiifolia.*
Southern Compass Plant—*Silphium integrifolium.*
Sunflowers—*Helianthus scabra.*
Sweet Clover—*Melilotus alba and M. officinalis.*
Snow on the Mountain—*Euphorbia marginata.*
Shining Willow—*S. lucida.*
Sage Willow—*S. candida.*
Sumach—*Rhus glabra.*
Toad Flax—*Comandra umbellata.*
Tick trefoil—*Desmodium canadense.*
White Asters—*Aster salicifolius.*
Wild Bean—*Strophostyles helvola.*
White Prairie Clover—*Petalostemum candidum.*
Wild Grape—*Vitis vulpina.*
Washington Thorn—*Crataegus punctata.*
Wild bergamot—*Monarda punctata.*
White Flowering Spurge—*Euphorbia corollata.*
Wild Rose—*Rosa pratincola and Rosa setigera.*
Whorled Milkweed—*Asclepias verticillata.*
Wild Indigo—*Baptisia leucantha.*
Windflower—*Anemone cylindrica.*
White Willow aster—*Aster salicifolius.*
Virginia Creeper—*Psedera virginiana.*
Virgin's Bower—*Clematis virginiana.*

CONTENTS OF APIARISTS REPORTS, 1912-1922

Compiled by R. L. Parker

From the inception of the reports it has been the aim of each apiarist to furnish the very best material possible for readers. In the beginning the circulation was largely among beekeepers of Iowa, especially members of the Association. Each year has shown a wider circulation and in recent years reports have gone into most every state in the union. In the last few years requests have been received from many foreign countries. Many libraries in all sections of the United States are carrying complete files of the reports. In the period covered by the first ten years of existence the reports did not carry a Table of Contents so it is hard to find articles even within an issue. To make this valuable material readily available to present day readers and research workers it is deemed advisable to offer a summary of the contents of these ten reports. Since the period under discussion each report has carried a Table of Contents. It is to be regretted that all back issues are not now available for distribution. Whenever workers are interested in individual articles it will be possible to secure the report on the customary library privilege.

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