STATE OF IOWA

1920

REPORT OF THE

STATE APIARIST

FOR

The Year Ending October 31, 1919

Also Report of the Convention of the Iowa Beekeeper's Association in Des Moines, November, 1919

F. B. PADDOCK, State Apiarist,

Ames, Iowa

Published by
THE STATE OF IOWA
Des Moines

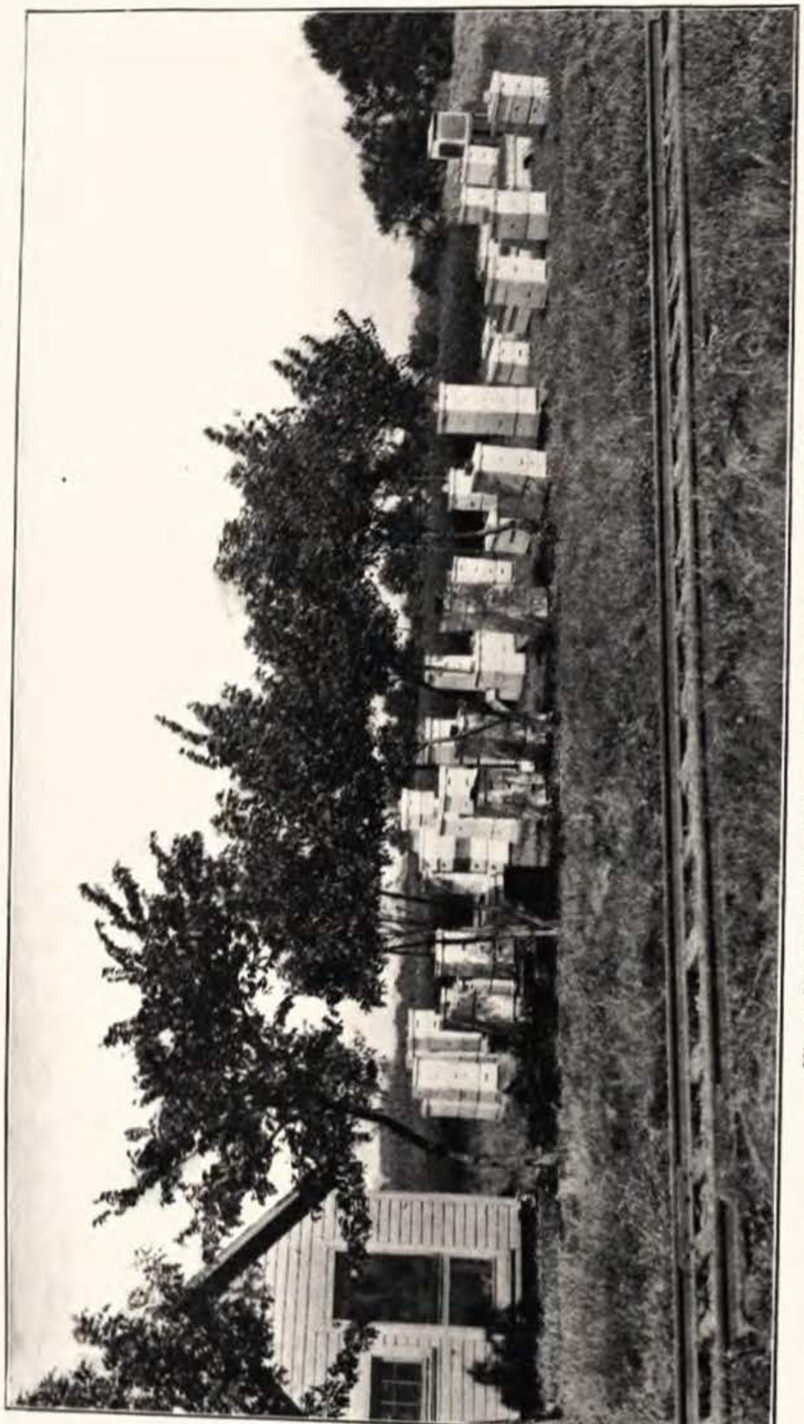
LETTER OF TRANSMITTAL

Ames, Iowa, December, 1919.

HON. W. L. HARDING, *Governor*—

SIR: In accordance with law, I herewith transmit to you my second annual report as State Apiarist.

F. B. PADDOCK, *State Apiarist.*



View of Experimental Apiary at Iowa State College, Ames, Iowa.

STATE APIARIST'S REPORT

During the year of 1919 the work of the State Apiarist was somewhat broken due to the resignation of F. Eric Millen which took effect June 15th. From this date until September 1st, when my appointment became effective, the conduct of the work was in charge of E. W. Atkins, Special Field Agent, co-operating. Needless to say, under such conditions it was hard to maintain a continuity of purpose and constant endeavor. However, the results of the work for the year are very encouraging and prospects for the work during the next year are very promising.

The foundation of the work of the State Apiarist is a law passed by the Thirty-seventh General Assembly in 1917. This law defines the activities of the State Apiarist very clearly; disease eradication among bees in Iowa is based on educational measures among the beekeepers. The work of this year has been conducted along the same general lines as during the previous year.

1. Demonstrations in the apiary. These were conducted to show better methods in the care of the apiary.
2. Inspection of apiaries. This work was conducted in localities which requested it and where local co-operation was provided.
3. Short courses, lectures and demonstrations were held during the inactive season. These were conducted to show better preparation for apiary work.
4. Correspondence and literature. Special attention was given to many beekeepers in this way.

The opportunity for the development of honey production is almost unlimited, not that more bees are especially needed. On an area basis there are undoubtedly as many bees in Iowa as in any other state in the union, but in the production per colony of honey, Iowa ranks only eighth among the states. It is the production situation that needs changing and since there is no state any better adapted to honey production the need of educational effort among the present beekeepers is very great.

With the assistance of the Special Field Agent, co-operating with the United States Department of Agriculture, a project on increased honey production was conducted in twenty-nine counties. This work consisted of a series of five lectures and demonstrations in each county. The attendance at these 145 meetings was over 6,000 beekeepers. The extent to which the influence of these meetings was felt in the counties and over the entire state it is hard to estimate. Definite data regarding the increase of total production is not available at this time for the work is new in Iowa but records are being kept now so this information can be available later.

The law provides that "it shall be the duty of the said apiarist to give lectures and demonstrations in the state of Iowa on the production of honey, the care of the apiary, the marketing of honey, and upon other kindred subjects relative to the care of the bees and the profitable production of honey. Upon the written request of one or more beekeeper in any county of the state, said apiarist shall examine the bees in that locality suspected of being affected with foulbrood or any other contagious or infectious disease common to bees. If upon examination the said apiarist finds said bees to be diseased, he shall furnish the owner or person in charge of said apiary with full written instructions as to the nature of the disease and the best methods of treating same, which information shall be furnished without cost to the owner."

In the inspection work special attention was given to one country where co-operative effort in disease control had been started during the latter part of the previous year. Through the secretary of the county beekeepers' association, every beekeeper was advised of a schedule of demonstrations to be held on disease control. Sixty-six apiaries were visited during the period. Of these, seventeen were found to be free of any disease, in thirty-two apiaries, American foul brood was found and European foul brood was found in seventeen apiaries. In three apiaries both of the brood diseases were found. During the visits to these apiaries the symptons and treatment of the diseases were fully explained and where possible demonstrations were given. Isolated cases of disease were given careful attention whenever possible.

During April a short course for experienced beekeepers was held at the Iowa State college at Ames. The attendance at the course was twenty-five. The program included several speakers of prominence from outside of the state. In May a short course for beginners in beekeeping was held at the college with an enrollment of thirty-five. Both of these short courses proved

profitable to those in attendance and the influence of such work reaches far beyond the attendance.

The correspondence course proved very popular during this year, 172 beekeepers were enrolled for the work. It is felt that this is a very effective manner of reaching those who are sincerely interested in the development of the industry.

As a part of the office correspondence a circular entitled "Seasonable Hints" was published every other month and distributed to the entire mailing list of three thousand beekeepers. This proved to be a very effective means of disseminating timely suggestions for apiary practice.

During the year county beekeepers' associations were organized in ten counties. The value of organization and co-operative effort is becoming apparent to the beekeepers in many sections of the state. The associations have been able to buy supplies at a great saving to their members. United effort is proving to be of immense value in stabilizing the honey market. The future of these associations is filled with opportunity to do much of benefit to the members.

Following is a summary of the work to December 31, 1919, as required by Section 2, Chapter 289, Thirty-seventh General Assembly:

Number of apiaries visited	72
Number of demonstrations held	14
Number of lectures given	52
Number of apiaries examined on request	10

EUGENE SECOR

Since the publication of our last annual report there occurred the death of Mr. Eugene Secor at his home in Forest City, where he was gored to death by a bull.

It is not often that a man succeeds in winning the esteem and friendship of everyone as did Mr. Secor, and entirely by unaffected geniality and simplicity, for he was as disingenuous as a child, as warm hearted as a woman, and a noble man in every fiber of his being.

While Mr. Secor was not a scientist, he was scientific in all his work. He never attained great eminence in any field of study, yet his advice and help was often sought on many subjects, and it was invariably good. Horticulture and beekeeping were his favorite studies.

Space will not permit of all we should like to say about our departed friend; however, he was a liberal contributor to the bee journals of the country for forty years and active in beekeeping affairs, holding official positions in state and national associations. He was judge of the apiary department at World's Fair, while he served in the same capacity in the Iowa State Fair for several years.

He contributed much to the success of the National Beekeepers' Association while the State Horticultural Association felt his influence. He was at one time its president, and a director for many years.

His home town felt his kindly influence and many trees planted under his direction will serve as monuments to his memory. His home in Forest City he called "The Shelter," and to it he took his bride some fifty years ago and there he reared an interesting family.

Mr. Secor was a breeder of shorthorn cattle, and as such attracted much attention. He was founder of the First National Bank of Forest City and in church affairs arose to leadership. In educational affairs he was prominent, being a member of the Board of Trustees of Cornell College at Mt. Vernon for several years. He was successful in political matters and was at one time elected as a member of the House of Representatives.

Mr. Secor was a poet of no mean ability, and this article is well ended with the best one he claimed he ever wrote:

IF I SHOULD DIE TONIGHT

An atom in the vast universe,
A bit of star dust in a field of light
Am I, nor would the world its course reverse
If I should die tonight.

The air is full of spirits of the past,
Spirits that once to the flesh were clear to sight;
Forgotten all, as I shall be at last
If I should die tonight.

But deeds, not men, are what alone survive,
Pure thoughts are angels clad in garments white
Will words or deeds of mine remain alive
If I should die tonight?

Shall one kind act, one unremembered wrong,
One helpful word by me to cheer the right,
One phrase remain to speed the truth along
If I should die tonight?

Of all the ones I know who call me friend
Would one, just one, for life keep memory bright
With some sweet thought I spake while here, or penned,
If I should die tonight?

—Eugene Secor.

HAMLIN B. MILLER.

The news of the death of Mr. Hamlin B. Miller at his home in Marshalltown came as a shock to the writer, who had known Mr. Miller for more than 40 years, long before either of us were engaged in beekeeping. Mr. Miller's death seemed all the more untimely in that he was but 57 years old. The immediate cause of his death was, it is said, diabetes.

Mr. Miller was a printer by occupation, and was continuously engaged in that business in Marshalltown for nearly 50 years. He gave to his art the same enthusiastic attention that he did to beekeeping in later years, a calling which he took up to get into the great out-of-doors, hoping thereby to improve his health; however, the Grim Reaper has called him.

Mr. Miller was well known in both state and national beekeeping circles, as a charter member of our State Association, and latterly a secretary of the National, in the latter days of that organization. He was very popular as secretary of the State Association and vice president at the time of his death. While secretary he issued a pamphlet which he called "Bee Pep" which was small, but full of life.

Mr. Miller was a genial personality, a sincere christian and a good friend, and will be missed by our circle of working beekeepers.

IOWA BEEKEEPERS' ASSOCIATION

The eighth annual convention of the Iowa Beekeepers' Association, Inc., was held in the auditorium of the City Library, Des Moines, on November 10, 11 and 12, 1919. The sessions were presided over by President A. F. Bonney of Buck Grove. The following committees were appointed:

Nominations—Wallace Park, F. G. Hausz, Bert A. Brown.
Resolutions—E. W. Atkins, F. W. Hall, J. R. Palmer.
Legislation—Frank C. Pellett, F. C. Scranton, R. C. Warring.
Auditing—J. W. Stine, C. W. Price, R. D. Howard.
State Fair—Bert A. Brown, J. D. Seaman, F. W. Blackman.
Inter-State Fair—B. A. Aldrich, W. W. Boutilier, W. S. Walker.
Fair Price—Ed G. Brown, H. E. Roth, secretary.

Resolutions were adopted as follows:

Resolved, that we sincerely thank the Chamber of Commerce of our Capitol City for the courtesy they have shown us in arranging for this association meeting.

That we heartily commend the work being done in apiculture by our State College of Ames, and by the Federal Bureau of Entomology at Washington, D. C.

That we appreciate the presence at our meeting of C. P. Dadant, Frank C. Pellett, Kenneth Hawkins and H. C. Cook from adjoining states.

That continued prosperity of our association depends on its members, therefore we urge a more active membership in the association.

That this association accept the invitation of the National Beekeepers' Association and send a representative to the delegate meeting in Kansas City on January 5th and 6th, 1920.

The following officers were elected for 1920:

President—Dr. A. F. Bonney, Buck Grove.
Vice-President—Ed G. Brown, Sargents Bluffs.
Secretary-Treasurer—F. B. Paddock, Ames.
Directors—J. C. Donahue, Holbrook; F. H. Stacey, Iowa Falls; M. B. Johnson, Webster City.

PRESIDENT'S ADDRESS

A. F. BONNEY, Buck Grove, Iowa

It is a pleasure to see so many of our association members here today, old and new, while I remember that some will never meet with us again. Death has claimed some, notably our former secretary-treasurer, Mr. Hamlin B. Miller, whom I had the pleasure to know for forty years. Some have removed from the state, and in this way we lost Mr. F. Eric Millen, who was a prince of good fellows, and an enthusiastic beekeeper. However, we have gained in his stead, Mr. F. B. Paddock, late of Texas, who is acting secretary.

I am not going to consume much time in this, my address, because a good program has been arranged by our secretary, and the speakers there listed will entertain and inform you far better than I could hope to do. There was a suggestion made in 1917 that a committee be appointed to assist the secretary in getting up the annual program, but if anything along that line was done the committee did not make its presence on earth felt, and it is, I think, evident that the work of arranging our program will always fall on the secretary, because he has in his office all the data necessary. If however, you consider such a body necessary it is your privilege to create it.

I do not know what more to say, unless I mention the good average honey crop for the year, which was, I believe, sold at a very fair average price. Present conditions promise a good crop for 1920, if spring conditions are favorable. In 1918 the clovers were killed off, or did not grow, but the summer ended with the ground, in my vicinity, carpeted with clover.

It might be well to mention that at our Agricultural Experiment Station at Ames, an annual white sweet clover has been developed and reports from it indicate that it is as good a yielder of nectar as the biennial white. It is hard to estimate the benefit of this to beekeepers. The Henry Field Seed company of Shenandoah secured some of the seed, and this season had some to sell. I think likely that by next fall there will be an abundance of the seed in the country. I suggest that each member of this association plant seed of this clover, so that the country will be covered with it.

Another matter is that of our association dues. I have always thought that our annual dues of 50c rather insignificant, considering the benefits derived. The addresses delivered at our annual meeting, and later on appearing in the annual report of the secretary, are worth much more than we pay for dues. I hope before we adjourn this meeting that this matter may receive proper consideration.

PAPERS READ AT ANNUAL CONVENTION

BIG HIVES

C. P. DADANT, EDITOR AMERICAN BEE JOURNAL, HAMILTON, ILL.

Some of my hearers will probably think that this is a hobby with me, for they have perhaps heard me elsewhere, or have read something from me on this same subject. But really, the question of big hives, which we discussed very largely some 35 to 40 years ago, was set aside by us as a hopeless question when brought before an audience of American beekeepers.

It was only three or four years ago that Mr. Pellett, one of your own state, had occasion to investigate our private system of beekeeping in actual practice. He became enthused, urged us to bring it forward, and brought it forward himself at meetings. Evidently the time was ripe for an investigation of this question by the American honey producers, for we have heard about it on all sides. We were requested to address beekeepers on large brood chambers, not only at state meetings, but also at "short courses" at colleges. The attention given to what has been called the "Dadant System of Beekeeping" is very pleasing to us, for we think no beekeeper will ever regret having investigated it whether he follows it or not.

Our adoption of large hives was due to comparative experiments of big with small hives on a large scale. For instance, as early as 1870 we happened to buy some 40 hives of 20-frame Quinby size. These were too large; but we also tried very small hives, for we used a number of nuclei at about the same time and tried to winter colonies upon six frames half the size of a Quinby frame or 9 inches in length by 11½ inches in depth. We finally settled upon the hive which we now use, which contains 10 Quinby frames and is about equal to 13 or 14 Langstroth frames.

When a man shows a preference for a certain thing he should be able to discuss this preference and tell the reason of it. That is to say, we should be able to give the theory of our practice. In fact, it is much easier to explain a theory when you have had years of practice to prove its value than to propound the theory first. I judge others by myself, and I readily imagine that others have, like myself, built up theories which practice proved incorrect, because we had overlooked some facts, seemingly unimportant which overthrew our plans and our reasoning.

There is a fundamental fact in beekeeping which every honey producer acknowledges as the basis of success. It is the producing of a large force of bees, as large as possible, in our hives, for the honey crop. It is true that bees are not all similarly active, that some races are better gatherers than others. But given a colony of active bees, it will produce honey according to its population of field workers at the time of the honey crop. So it is imperatively important that our colonies should be enabled to breed to the utmost of their capacity in time for the harvest.

Given two colonies of active bees, the one which will succeed better is the one whose queen is the more prolific of the two. This is also an axiom which cannot be denied. However, there is a condition to this. The prolific queen must be given occasion to develop her prolificness at the right time. As Mr. Demuth, of Washington, puts it most happily, we must produce our bees "for the honey crop and not upon the honey crop." Granted this, our brood chambers must be of a capacity which will allow the most prolific queen to breed to the limit of her fertility during the season preceding the time when her bees will prove useful in the harvest field. As it takes 21 days for a worker bee to develop from the egg and two weeks more before this bee will become a field worker, in normal conditions, it is therefore necessary that the heaviest of the egg-laying should be at least five weeks before the full harvest.

The queen should have ample space to lay all the eggs that she can produce. Ancient writers stated that a queen would lay the immense number of 200 to 500 eggs per day. Dzierzon, Berlepsch, Langstroth and Quinby discovered that queens could lay about ten times as much as above stated. Our late friend and teacher in the rearing of queens and the production of honey, G. M. Doolittle, state that he had queens lay 5,000 eggs per day. This is extraordinary. But it is not extraordinary to have a queen lay 3,000 eggs per day for several weeks together if everything is favorable.

as required by Section 2, Chapter 289, Thirty-seventh General

Now what are the favorable requirements for a queen to lay the largest number of eggs that she is capable of developing in the few weeks of intensive breeding?

There must be: First, plenty of bees to keep the brood warm and nurse it; second, plenty of food, honey and pollen, for it is out of the question for these to rear brood unless they can feed it; third, there must be plenty of available room, plenty of worker cells in reach of the queen.

Here is point upon which we must dwell. Experience has taught us that the standard Langstroth hive is too shallow. At any rate we never succeeded in getting as much brood in Langstroth frames, at one time, as in deeper frames. Why?

Did you ever have frames with a partition in them, a crossbar, either horizontal or perpendicular, in the center? If you did, you have perhaps often noticed that the queen may lay eggs on one side of that partition and not on the other side, at that time at least. So, if there is brood on both sides of a dividing bar, the brood may often be of a different age. The explanation of this lies in another fact. The queen, in order to lay eggs as fast as they mature in her ovaries, must lay them very rapidly. So she follows a very methodical practice. She lays around a circle. Beginning in the center of the cluster, in the warmest part of the hive, she keeps going around that center, laying an egg in one cell, then going to the next cell to do the same. A little reasoning will

readily show us that it is necessary for her to do so. If she were to go at random she might look into hundreds of cells that were already occupied before she found one that was empty. Old queens that have lost their wits and probably also their fertility do that very thing. They lay their eggs in a scattered way, and a good beekeeper will usually pass upon the value of a queen according to the more or less methodical way in which she follows the circular method in laying. It is not difficult to recognize method in a queen when we look at the greater or lesser regularity of her brood in the cells.

When the queen gets to a crossbar, during her regular egg-laying circle, she is thrown off her track. She either goes beyond that crossbar hunting for more cells and resuming the thread of her regular laying after more or less delay, or she turns back and goes the other way. So the larger the circle that she finds the better she is able to develop her fertility. This fact explained to us why the colonies in large frames proved better honey producers than those in shallow frames.

A colony in an eight-frame Langstroth hive may be given enough room, by putting a second story on top of the first. In fact it is given too much room then. Sixteen Langstroth frames are too many for a queen to fill with brood even when we deduct the space needed for honey and pollen. It is true that she may put brood in nearly all of them, if the weather be warm and the colony powerful, but the combs will not be filled full and when the crop comes, if the same amount of breeding room be left, there will be a large amount of honey placed about the brood.

When we use a two-story Langstroth eight-frame hive for breeding, if we do not wish to harvest honey mixed in among the brood combs, we must do like our old experienced friend, Dr. C. C. Miller, who removes one of the two stories when the crop is fully on and confines the queen to the lower story. This is the only way to make sure of a satisfactory honey crop with small hives unless we use queen excluders between the stories.

There is another disadvantage to putting on two or more stories. The queen is much more likely to go up from the lower to the upper than to come back to the lower one. She will usually go back only when the storing of honey in the cells drives her back by the shortage of breeding space. If three stories are given she will often roam over all three.

For the reasons above mentioned, we found, both in practice and in theory, that the brood chambers which the English call "storifying brood chambers" and that we call shallow breeding stories, are not so advantageous as the large brood chambers, for the production of brood and bees in anticipation of the honey crop. But there is another disadvantage to the shallow brood chambers.

Bees breed in a circle. That is because the cluster always forms in the shape of a globe, the best shape to conserve heat. So in winter we find our bees clustered in the shape of a ball. In a shallow hive, the bees at the top of the ball are too near the top of the hive. The amount of honey stored, which should be normally as nearly as possible above the cluster, is more plentifully stored on the ends, less in reach of the bees when the weather becomes very cold. In this as well as in the previous subject mentioned, we found theory and practice to agree. Bees in shallow hives winter less successfully than those in deeper frames.

This, although not invariable—there is nothing invariable in beekeeping—proved sufficiently uniform to induce us to abandon the Langstroth frames in our practice.

Deep, large brood-chambers, are therefore preferable for use, in our opinion; because they allow of greater breeding by the queen at the proper time; because they allow of the wintering of a larger population, in better reach of their honey. So we have better success in wintering, more bees in spring more bees for the honey crop and a greater crop of honey in consequence, with less anxiety about sufficient stores for the cold season.

Small hives cause much swarming, having a more crowded condition when the colony is at its maximum. Small hives produce less bees than larger ones. Small hives contain a scanty amount of honey for winter. Small hives, being less populous, there is greater danger of their being lost through cold. Small hives, confining the queens in their breeding, do not allow the beekeeper to recognize which queens are the most prolific as easily as he may recognize it with large hives. So he is not so readily able to select his best queens for breeding queens. Small hives cast more but lighter swarm than large hives. Small hives, when tiered up, have a narrower base than large ones and are therefore more easily upset by strong winds. Small hives are less easy to ventilate, since for the same amount of space, the bees have to force the air a greater distance in order to ventilate the entire hive and supers, than with broader hives.

However, small hives have some advantages. They are easier carried about, to make divisions, to put them in the cellar, and for all the manipulations of artificial increase. They are also cheaper. More of them may be loaded on a single vehicle to transport them to and from out apiaries. Small, shallow hives such as the Langstroth, may be made of lumber not over 10 inches wide, in one piece, while deep hives, in the present condition of the lumber trade, must be made of two pieces tongue and grooved, for sufficient depth.

We hold that a large brood-chamber should be compact, sufficient for all the requirements of the most prolific queens and to supply all the honey that a populous colony will need for winter. This honey must be in available reach of the cluster. A large number of shallow frames, such as those of a thirteen-frame Langstroth hive, is not as satisfactory as a smaller number of deeper frames with the same comb surface. It divides the cluster unnecessarily, it increases the manipulations, it compels the queen to change from one comb to another oftener to lay the same number of eggs. It supplies less honey above the cluster in winter. The more honey there is above the cluster, the more safely bees will winter if the are compelled to remain for several weeks without moving their cluster.

THE SPACING OF THE FRAMES

The spacing of frames has also something to do with the success of the colony. It is one of the important points in the consideration of a large brood-chambers.

Our early teachers, Langstroth and Quinby, were divided upon the question of frame spacing. Langstroth spaced his frames a trifle over 1⅜ inches from center to center. Quinby took the comb spacing of 1½ inches fom Dzierzon. Each thought he was right. But there was no discussion of the point. No comparative experiments were made at that time. Yet there is quite a difference in results. The more I dig into this subject, the more I am convinced that the wider spacing is advantageous.

When we go to the bees for their advice on this matter, we find that they accept either spacing. As I stated at your meeting of 1917, we did not realize how much advantage there was in the wider spacing till our attention was called to the question.

With the wide spacing there is a greater amount of room for ventilation between all the combs, during the breeding season. This put the colony more at ease and helps prevent natural swarming. It also gives the bees more space to store honey in each comb, for in the winter they will not need so large a passage, so they thicken the part of the combs in which honey is put. There is thus a greater amount of honey in each comb above the cluster creating a more desirable condition, since more bees can cluster under it and there is less need of their moving away to get to the stores.

The only objection to the wide spacing that has been raised by objectors is that it requires more bees in spring to keep the space warm between the combs. This is true. But in practice we find that, since the bees winter better, in a large cluster, there are also more bees, as a rule, when spring comes, to keep the brood warm, and the cycle of the seasons is thus gone through with greater success.

Large, comfortable brood chambers produce larger colonies. They also require larger supers and these are filled as readily as smaller supers on smaller hives. This result is evident to anyone who tries large and small hives in sufficient numbers side by side. I have heard people say that they had tried eight-frame and ten-frame Langstroth hives side by side. They thought that they had tried large and small hives. But the ten-frame Langstroth hjves are not large hives. To make a positive test, with prolific queens, of large and small hives, one should try at least twelve-frame Langstroth brood-chambers.

I do not wish to be understood as condemning beekeeping with small brood-chambers. A man can succeed even with small hives. But I have positive evidence that large hives are best.

I have no ax to grind. I do not wish to be understood as claiming a panacea. I repeat it, our extensive experience with large and small hives dates back over 40 years and every year adds to our conviction. But we should not have raised this subject in conventions, had it not been for the inquiries of our friends. The facts which I have given will bear discussion and we are very willing to have them thoroughly ventilated.

In closing, let me make one suggestion to those who may be disposed to try the large brood-chambers. Do not make a test trial on too small a scale. Any comparative experiments should be made on not less than half a dozen hives of each kind. More would be still better. In a trial on a small number of colonies we may strike exceptions. Our own tests were made on hundreds of colonies. The answer has been overwhelming.

LIFE AND DEATH IN THE HONEY BEE AND ITS APPLICATION TO APICULTURE

BY H. R. WERNER, DEPARTMENT OF ZOOLOGY, IOWA STATE COLLEGE*

Bees are useful to the beekeeper only in so far that they are alive. After a life of activity the bee dies. With this in mind it is evident that there is no phase of beekeeping which is not related directly or indirectly to the question of life and death in the honey bee. For the beekeeper it is not a question of the difference between a living bee and a dead one, but a question of what determines the life time of the bee, or when does the bee die?

The colony of bees which accomplishes the beekeeper's purpose is composed of a great many individuals, each one of which passes through a life circle. The life of the colony is tied up in the life of the individual bees and one cannot be discussed without an intelligent notion of the other. The lifetime and behavior of the individual bees as well as the colony is determined primarily by the question of food. It is well known that no animal can live very long without partaking of food. The question of food is no doubt the most important factor in animal organization and behavior. The question arises, therefore, what is the role of food in relation to the individual life and how is the food utilized? An understanding of these three Biological Principles, namely, the lifetime of the individual, the life of the colony and the relation of food to both, forms the basis for the intelligent bee manipulation in all its phases.

THE LIFE CYCLE OF THE INDIVIDUAL

The individual bee begins its life as a fertilized egg. The egg contains the germ which by growth, division and differentiation finally develops into the adult bee. Growth and its resulting changes within the egg are dependent upon food which has been stored there during the development of the egg within the queen. The food which is stored in the egg must be sufficient to last the developing young until it can take

*Deceased.

food itself. The egg is, therefore, a sort of lunch box in which is stored food to last for a given length of time. After three days a larva hatches from the egg. During the larval stage the bee eats the food which is placed in the cells by the adult bees and the young bee simply eats and grows. During the pupal stage, which is comparatively short, the young bee does no eating. That this short fast is not particularly to its liking one will appreciate when he sees with what haste the adult bee partakes of honey after gnawing off the cap of its cell and emerging as a full grown bee. The bee now becomes an active member of the colony and the rest of its life is tied up in the activities of the same.

It is important to appreciate that the life cycle of the bee is controlled by the primary function of taking food and using it. If the larva is not fed it soon dies; or if it is supplied with honey, containing germs of a bee disease, it suffers the same fate.

THE LIFE OF THE COLONY

The colony is made up of a great many individual bees and consequently the lifetime of the individual determines or regulates the life of the colony. The arrangement, however, is so that under normal conditions the adult individuals live longer than the time necessary for an adult to develop from the egg. We may say then that the life of the colony is in a general way perpetual. The specialized individuals necessary for maintaining the colony, are the queen, who lays all the eggs, the drones, whose only function is to mate with virgin queens and the workers, who perform all other necessary labor in so far as it maintains the colony.

In the activities of the individuals of the colony, the question of food is the controlling factor. The honey flow determines the rate of egg laying by the queen: it determines the presence and activity of drones within the colony and most of the activities of the worker bees. When flowers fail, for a long time, to secrete nectar and the honey supply within the hive becomes exhausted, then the individuals die and the life of the colony ceases. Again it is a question of food and the bees realizing the importance of food supply themselves abundantly for any emergency while man in commercial honey production utilizes this far sighted propensity in the bee to his own advantage.

It is interesting at this point to recall that the honey bee is one of the few animals whose individual life is dependent upon the maintenance of the colony organization. No bee by itself will live for a long time, and what is more important, neither can it perpetuate the species. This state of affairs can only be explained from the fact that the individual bees have sacrificed natural propensities for the benefit of social organization. The bee is very jealous of the welfare of the entire colony and all its efforts are directed thereto. We may say then that the life of any individual bee is secondary to the life of the whole colony. With this beautiful organization and operation within the colony of bees it is well for social man to observe and learn the lessons of socialization, as nature demands it, from the bees.

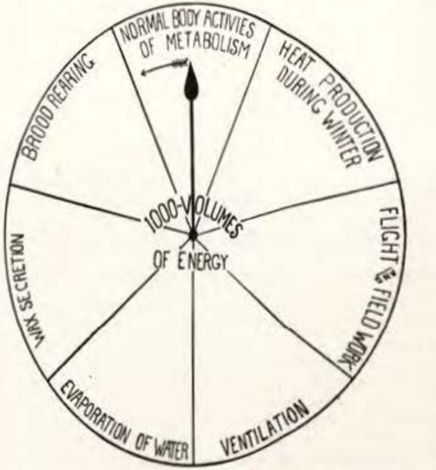
FOOD AND ITS RELATION TO LIFE AND DEATH

Since the life of the colony is dependent upon the life of the individual and the life of the individual dependent upon food the question as to how life is maintained in the individual bee hinges upon the question of food and its utilization by the bee.

It will be necessary at this point to recall the organization of the bee. As has been stated above the bee began its life cycle as an egg and the adult is the result of growth, division and specialization of the egg. The bee is consequently made up of a great many, very small units called cells, just as a brick house is made of a great many bricks. These cells are made of a jelly-like "life stuff" called protoplasm just as the bricks are made of clay. All the organs, every part of the body are made of these cells or products of the cells. But the cells differ from the bricks, in that the animal starts as one cell (a fertilized egg) and develops by cell division into an adult made of many cells (the brick house). You have some idea what happens in the development of the bee if you can conceive of a brick placed upon the ground and which takes from the soil and air certain elements and converts them into substance like itself. In this way the brick grows and after a time splits into two bricks like the original one. These in turn do the same thing and as the number of bricks increase they arrange themselves so as to form a house. The growth of the cells prior to divison is the result of food which is taken either from the egg before hatching or the food supplied by the adult bees to the larva in the cell, or the honey consumed by the adult. The food, regardless of its source is converted into the protoplasm of the cells; it becomes the clay of bricks. Since the entire bee is made of cells and the cells made of material derived from food, we see that all the vital activities center around these two conditions. In performing its alloted functions, however, the bee is burning up the protoplasm of the cell just as you burn up coal in the furnace to get heat. We can now resolve the vital functions, life processes, of the honey bee around the term energy.

We know energy in various forms but in all its forms it possesses the ability to do work. Work is the overcoming of resistance. The source of energy is the food and from it the energy is either liberated directly in the form of heat during digestion or stored in the cells to be burned up with liberation of heat when the bee does work. The bee is consequently a sort of machine for the reception, transformation and expansion of energy. When the building up is faster than the tearing down, we say the bee is growing. After a time growth stops and the bee dies when the protoplasm of the cells can no longer be replenished as it is burned up in doing work. There is then a limit to the amount of energy which can be used up and which for a time is replaced. The fires of life dies out when all the coal (protoplasm) has been burned up. It is not difficult to calculate how long ten tons of coal in your cellar will last if you use a ton every two weeks. If your winter's supply is limited to ten ton, you find it very convenient to conserve that ten ton to the utmost. So we may say that the life of the bee is expressed

in terms of 1000 volumes of energy. This is all consumed in a life time of normal activities in the bee. When that supply is exhausted the bee dies and it behooves the beekeeper to conserve the supply so that he may use it to his best advantage. Any useless work performed by the bee cuts off the total supply by just so much. The heat which a poorly wintered colony is compelled to generate is the energy which if applied to brood rearing in the spring spells the difference between failure and success for that colony. (Fig. 1.)



The lifetime of the bee can be represented by the area of a circle. The various, important activities in this lifetime are represented by segments. The life of the bee can also be expressed in terms of energy transformation. The sum total of energy is expressed in terms of 1,000 volumes. Every segment of life activity represents a certain fraction of the available sum total of energy. One turn of the hand expresses the lifetime of the bee in the transformation of this given volume of energy. It is evident that if heat production during winter, for example, consumes more than its allotted area of energy it reduces the energy available for some other necessary function by the amount overdrawn. When all this available energy is used up, or when the hand makes one complete turn, the bee dies and no effort, on the part of man, can prevent it.

The question now arises, can in any way the normal lifetime of the bee be extended? I fear that from the present status of scientific knowledge the wish is a hopeless one. Some theories have been maintained but the man who championed the best one died at the age of seventy-one. The honey bee, like all other animals, is a creature of inheritance and environment. While man has made much ado about the mortal bodies of other animals and especially himself it is quite evident that the body performs its most important natural function when it serves as a freight car to carry the germ over a definite portion of its course. It is not an accident that growth of the body ceases with the ripening of the germ cells and after the species has been perpetuated the freight car is still shifted about for a time but its decline into uselessness or death is close at hand. The normal process is somewhat complicated, in the highly specialized division of labor in a colony of bees. The process, however, is a familiar one in the evolution of the animal kingdom, namely, colonization, division of labor, specialization and a disappearance of the useless functions.

Specialization has its great advantages but it also exacts a price. Since we cannot alter the organization of the honey bee we must confine our activities to a regulation of the energy transformation with which it has been endowed by nature.

APPLICATION TO APICULTURE

It becomes evident from the above discussion that in order to conserve the energy of the individual bees and likewise the colony we need to refrain from compelling them to do needless work. Let us see how scientific beekeepers apply these principles in apicultural practice.

ARRANGEMENT AND LOCATION OF THE HIVE

The hive should be arranged so as to cause the least labor in getting to and from the combs and the field. The entrance should be large in the summer to prevent crowding and the frames should have sufficient space on all sides to permit the passage of the bees. Nor should these spaces be too large or they will only fill it up with wax and defeat our purpose. The empty supers should be placed where the bees can most readily reach them above the hive body. Ventilation and shade should be supplied so that the bees will consume as little energy as possible in the maintenance of an optimum temperature. The energy which is saved in this way can well be used in ripening the honey which in itself consumes an enormous amount of energy. Energy which is saved to the bees with proper ventilation and shade conserve the total volume to the same extent. The rapidity with which a bee fans its wings in ventilation and flight is a most wonderful phenomenon and must make heavy drains upon the total volume of energy. The question of the location of the apiary in relation to the source of nectar is very important.

SECRETION OF WAX

Aside from the fact that the secretion of wax by the bee consumes considerable and valuable time the most important phase is the fact that wax secretion is a considerable drain upon the available volume of energy. I cannot conceive of any other activity normal to a colony of bees which makes such a heavy drain for the volume of the product produced. There are several reasons for this conclusion, any one of which is evident to the observing beekeeper. First is the volume of food (honey) consumed during a period of intensive wax secretion. It is estimated that from 7 to 20 pounds of honey is consumed in the production of one pound of wax. The food, as has been shown above, is the best index as to the amount of energy liberated in the burning up of the protoplasm since it represents the attempt of the bee to replace the used protoplasm. In the second place the wax is the product of gland cells which means that the food goes in and wax comes out and the change is due to the almost magic activity of the cells. The activity and changes taking place within the cell can only be appreciated by a microscopic examination and the inevitable conclusion is that a large amount of energy is used up. The third argument in the same direction is the fact that only young bees are capable of wax production to any extent. In youth the cup of energy is overflowing and only under such conditions is the task properly performed.

It becomes plainly evident then that in order to conserve the energy of a colony of bees, wax production must be kept to a minimum. Full sheets of foundation should always be supplied to frames and sections while the extracted honey producer knows very well the value and gain in having an abundance of drawn comb.

CONSERVATION OF THE ENERGY OF THE QUEEN

A good queen is worth her weight in gold. A poor one causes bucketsful of trouble. The progressive farmer knows the difference in value between thoroughbreds and high producing stock as compared with grade stock. Few beekeepers, as has been my experience, realize the difference between good and poor queens. To them a queen is a queen and to them beekeeping will also always be a failure. It takes years of careful observation to ascertain which are your best producing queens and then using their offspring to requeen poor colonies in order to build up a maximum producing apiary. Progressive beekeepers have many queens which they might give away and one or two that could not be bought for any price if it was impossible to replace them. Why? The answer is evident.

While natural conditions normally regulate the rate of egg laying in a queen, yet there are times when the egg laying of a good queen should be curtailed so as to have her lay a maximum number when most needed. An exceptional queen should be kept several seasons after she has passed her commercial usefulness, simply for the queens which can be reared from her.

The relation of egg laying from the standpoint of energy is indeed a remarkable one. That a queen will lay two and three times her body weight in eggs in twenty-four hours is a thing which must be seen before it can be believed. Besides intense egg laying extends over a period of weeks and is repeated for a number of years. I know of nothing else like it in nature. Bees are certainly wonderful animals. The energy liberated in the normal process of egg laying is terrific. Any conservation of the energy of the queen is, therefore, a direct gain.

WINTERING

The problem of wintering is no doubt the most important one from the standpoint of this present discussion. The entire question might normally regulate itself if it were not for the fact that bees cannot under most conditions, leave the hive for long periods during the winter.

It has been demonstrated by Dr. Phillips and Mr. Demuth that the ideal temperature conditions under which bees should be wintered is 57° F. The reason is that at this temperature the bees within the colony are in their most inactive state. They are doing practically no work of any kind. Not doing any work, they consume practically no honey which is a certain index that little or none of the protoplasm is being burned up with its corresponding liberation of energy.

In a colony of bees exposed to the low temperature and winds of winter the bees in an attempt to maintain an optimum temperature within the hive, cluster, then by muscular activity generate heat. The colder it gets the harder they work. The honey consumed under such conditions is in proportion to the work done. The varying proportions of indigestible material from different kinds of honey or other food collects in the intestine and as the bee normally excretes only during flight, it is held until dysentery makes retention impossible. Under normal conditions all these things might be regulated in a natural way. The important thing is that when bees are compelled to generate heat for any length of time they die before they can be replaced in the spring. The lifetime of a worker bee during the active honey season is about six weeks. The bees, however, which constitute the colony in the late fall when brood rearing ceases must live until emerging brood can replace them in the spring. This extended lifetime of the bees is only possible if the greater part of the time is spent in a comparatively inactive state. Poorly wintered colonies certainly cannot do this and the colonies of bees lost during winter and early spring from insufficient protection is in some seasons appalling. The most critical period in the life of a normal colony of bees is the winter season.

SUMMARY

From the preceding discussion it is evident that the lifetime of the individual bees, which are the units of the colony, is limited to the expansion of a definite amount of energy. The source of this energy, as far as the bee is concerned, is the food which is consumed during its entire life from the egg until death and is primarily stored in the tissues of the body. The energy is liberated by burning up the protoplasm of the cells in doing the work necessary for the maintenance of life in the bees and colony. The total volume of energy available in the lifetime of a bee is illustrated in Figure 1 by the area of a circle and assumes 1,000 units. The units are so divided as to cover all the important normal activities in the lifetime of a bee. To exceed the allotted volume for any one function simply reduces the volume of the approached function by so much. When the total volume is consumed death comes to the bee and no effort of man can then stop it. Nature has so arranged the life cycle of the bees that under normal conditions the individual bee will not consume its total volume of energy in less time than it takes to rear a new generation. The careless beekeeper making no effort to conserve this energy loses many colonies and is a failure in the business. The intelligent and observing beekeeper writes his success in terms of conservation of energy in the bees. All questions and methods in beekeeping are secondary and dependent upon an intelligent understanding of these principles.

BEES AND HORTICULTURE

BY R. S. HERRICK, AMES, IOWA

It is a known fact that if it were not for bees and other insects that a great many fruits of various kinds could not set fruit on account of the lack of cross pollination.

In too many cases we find that instead of co-operation we have the horticulturist vs. the beekeeper.

(a) The horticulturist claims that bees carry blight.

(b) Some people want to spray their orchards in full bloom and in some states there are laws preventing this.

(c) Some people do not like bees, and do not want them around.

(d) Some claim grapes are injured by bees.

(e) Others claim that bees cause a shortening of the blooming period of cultivated flowers.

The Beekeeper says:

(a) The orchard bloom is of short duration and thus the bees are apt to become discontented.

(b) Some orchards are sprayed in full bloom and this kills bees. Because of this the beekeeper is apt to discourage spraying altogether.

(c) The horticulturist does not always appreciate what the bees do for him.

CO-OPERATION

Bees may carry blight but plant lice carry more and are considered by the up-to-date orchardist as a serious enemy.

Spraying in full bloom is wrong for the following reasons:

1. Spraying in bloom kills bees and the orchardist needs the bees for cross pollinating purposes much more than do the bees need what little honey flow they can get from the trees.

2. When the trees are in bloom the stamens and pistils are alive and fill to a certain extent the calyx end of the apple. When the blooming season is over the stamens and pistils are dead and it is then easier to fill the calyx cups with spray and thus do more effective work.

3. It is possible to make the spray solution strong enough to kill the bloom if applied when the trees are in full bloom.

Spraying orchards in full bloom is absolutely wrong for the best interests of the orchardist, as well as for the beekeeper.

When people learn to understand bees, especially the better breeds, they will come to appreciate and admire rather than to dislike and shun them.

Carefully run experiments have proven that bees are incapable of breaking the skin of fruit. They will of course suck out the juices when once the skin is broken.

It is an easy matter to prevent bees from injuring some of the greenhouse plants by simply screening the windows and doors.

The orchard blooms at a time when there is not much else for the bees to work on. If conditions are normal this gives the bees a fine start for the season. The orchard bloom furnishes a lot of pollen and some nectar.

No orchardist can afford not to have either in or near his orchard some bees. It is claimed by good authority that each acre of orchard should have on the average one colony of bees for cross pollinating purposes. It is believed that in many orchards in Iowa the set of fruit would have been better this year (1919) if there had been more bees in them during the blooming season. During the blooming season of this last spring (1919) the weather was cold and the bees could not work far from their hives. It is a known fact that many varieties of apples and pears will not set fruit with their own pollen. The bees do the most of the important work.

What is needed, is better co-operation between the beekeepers and the horticulturists of the state. Good will of each for the other should exist. I am sure that the horticulturist is, and will be willing to co-operate when he fully realizes the importance of bees in relation to fruit and other horticultural crops.

COMB HONEY PRODUCTION IN COLORADO

BY FRANK C. PELLETT

Colorado is a magic word to the summer tourist. The spell of her mighty mountains, the lure of her trout streams and the joy of motoring over her many good roads, attract thousands of vacationists during the heated months of summer. Colorado's mountain parks are rapidly becoming the playground of the nation. Fortunate is the man whose daily work is amid such surroundings. Some of the best beekeeping territory in the state is along the eastern foothills of the Rockies from Denver, north to Fort Collins.

It was my pleasure to visit several well known beekeepers of this region during the month of August, just when the honeyflow was on and conditions were most favorable. Prospects had not been favorable early in the season and it was feared that the crop would be short. A turn for the better set everybody to hustling on the supers and honey

Crawford's Packing House

Glimpse of Colorado Mountain Scenery

was piling up at a great rate at time of my visit. Several days were spent with the beekeepers in their regular work in the apiary in order to note any difference in practice due to local conditions. There are few localities where comb honey is still produced on the scale of Eastern Colorado. The men visited are experts who know their business and who are making money. While their methods differ widely in some respects from those practiced in the east, I would hesitate to question the judgment of such men that they are best for their locality. In the east we find that good winter protection is very desirable, if not essential. In Colorado few beekeepers provide anything except plenty of stores and a good windbreak. Most of them are agreed that a windbreak is very desirable. I found several who are experimenting with winter packing but none was quite ready to say that the results justify the extra cost. While the nights of winter are cold, there is almost constant sunshine during the day and the periods when the bees are unable to fly are short. Under these conditions most of the colonies come through the winter, although there is sometimes a considerable weakening of the colonies. Herman Rauchfuss has several winter cases in each of his apiaries. He has built them substantially with plenty of packing and there is no question but that the bees come through in fine shape in them. Although he expects to continue their use for some time and give them an opportunity to demonstrate their value, he is not yet convinced that they are worth the extra cost. I failed to find a single beekeeper in this section who is a warm advocate of winter protection such as we think necessary further east. There is unquestionably a great difference in conditions, yet to the outsider it would seem that some extra protection would relieve the bees of a heavy tax in generating heat during the cold nights.

A man who is prejudiced in favor of extracted honey production and an advocate of the large hive, gets something of a jolt when he finds so many men doing things in a big way with the eight frame hive and who object to anything larger. It is readily apparent that the large hive is unsuited for comb honey production, while the small hive could be used for extracted honey without serious inconvenience. However, in most localities the production of comb honey on an extensive scale has been abandoned in favor of extracted honey and probably will not again be resumed. The market during the wartime period has favored the extracted honey producer and the general impression is that it will continue to do so. It may be that so many will turn to extracted honey that the demand for comb honey cannot be met and that those who continue to produce it will profit by their persistence. While present prices makes comb honey profitable there is not as much difference in price as the extra effort necessary to produce a fine article would justify.

Herman Rauchfuss combines his manipulation for swarm control with the making of increase, thus doing away with one serious objection to the small hive. He winters in two stories with a large reserve supply of honey. A sufficient supply is insured to carry the bees through the

uncertain period of spring and with two stories for brood rearing he has in effect a large hive during the brood rearing period. His main flow is alfalfa and comes in August. At the beginning of the first honey-flow his two-story colonies will usually be full of brood and honey. A flight hole is provided in the upper hive body. This is lifted off and a comb honey super set in its place on the lower hive body. On top of this comb honey super is placed a honey-board with the escape hole covered with the queen excluding zinc. The upper hive body is then replaced on top of the original hive with the super between. There is then an opportunity for the bees to pass back and forth between the two compartments but the small opening through the escape hole covered with excluding zinc does not facilitate free movement. The bees soon use the flight hole in the upper body freely. At the end of eight or nine days, the division containing the laying queen is removed to a new stand and all queen cells cut from the queenless portion. A virgin queen is given to the colony remaining on the old stand. If he has been too busy to rear a sufficient number of young queens, he usually finds a sufficient number of ripe cells to supply one to each new divison. In this way it is easy to keep down swarming till the beginning of the main flow and also to build up the new colonies in plenty of time for it. He sometimes finds it necessary to give the new divisions a second story for brood rearing in advance of the principal flow, later removing it, somewhat after the plan followed by Doctor Miller. This method of making increase in advance of the honeyflow would not be practical in the clover region where it is difficult to get the bees up to sufficient strength in time for the flow. This season Colorado beekeepers have enjoyed a good flow from the third cutting of alfalfa, coming late in August and running into September.

Rauchfuss makes a practice of placing full depth hive bodies over his weak or moderate strength colonies. In this way he secures a considerable amount of honey in brood combs. This is not extracted but kept for reserve to make sure that all colonies are well supplied. He calls attention to the fact that many comb honey producers lose their best colonies every year because of the fact that the honey is all stored in the supers, leaving the hive body for brood. When the honey is removed the amount left in the one hive body of an eight-frame hive is not sufficient and the bees die before spring for want of stores. His plan of wintering all colonies in two stories with a large reserve supply of honey avoids this danger.

Herman Rauchfuss is probably the most extensive comb honey producer in Colorado at the present time, having about 1,800 colonies in thirteen yards. It requires expert management to run so many bees for comb honey and there are few men who might not get some good pointers from a man of such wide experience. He has one apiary in a protected situation in the Platte Canyon which is used principally for the production of bees. Full depth bodies are given them for storage of honey and this honey is used in turn for building up other yards. In this apiary swarms issue early, sometimes so early that snow storms

One of Herman Rauchfuss outyards for comb honey production

A Colorado outyard

occur later. He has had several swarms there as early as May first. On one side of this apiary is the Platte river which furnishes excellent trout fishing, on the other side is a beaver dam. It is needless to say that visitors find much of interest in visiting this apiary, besides the bees.

Until he sold his bees last spring, A. J. McCarty was probably the most extensive comb honey man in Colorado. McCarty sold 2,200 colonies and leased the rest and is taking a well earned vacation. However, he is not content and will probably get back to the bees another year. When I visited him at his home in Longmont I found him a very agreeable chap and a live one when it came to discussing bees in general. He was exceedingly modest about his own success, however, and when it was proposed that he tell something of his methods and experience, he made a counter proposition, that we go with Prof. Sprangler to his cabin in the mountains and spend the night up there. This was too good a chance to miss and the invitation was eagerly accepted. Prof. Spangler has been a teacher in the Longmont schools for many years. Back east he would be considered an extensive beekeeper with his three hundred colonies. He has a cabin about thirty miles from Longmont, not far from Long's Peak. It is a wonderful drive along the little stream that winds up between the high mountains on each side and no more interesting scenery is to be found. If this was a publication devoted to travel, instead of bees, that trip to the Spangler cabin in McCarty's big White car, would furnish an abundance of material for a feature article. A trout stream runs within about thirty feet of the cabin door and but a few rods further up it is dammed by a colony of beavers who make their home there. It is not far to the home of Enos A. Mills, the naturalist, whose writings have attracted much attenion to the wild life of the region.

At Bloomfield lives Harry Crawford, who has made beekeeping an exclusive business for 28 years. He is accordingly one of the pioneers at making an exclusive livelihood from bees. He has about 600 colonies of bees and produced 900 cases of comb honey last year, beside several thousand pounds of extracted honey. He has a winter home at Long Beach, California, where he has gone for fourteen years to spend the winter months.

I was especially interested in Crawford's packing house, which is situated on one of the main roads to the mountains. His attractive window stops many a tourist who after buying a small amount of honey to use in camp, becomes a permanent customer after he has returned home. He sold last season as high as $178 worth of honey in a single day to tourists who happened along and were stopped by the sign and the honey display in the window. As will be seen by the picture, the house is well painted and fixed up as nicely as a dwelling. This is certainly an effective example of the value of advertising to the packing trade.

DO'S AND DON'TS FOR AMATEUR BEEKEEPERS

BY H. C. COOK, OMAHA, NEBRASKA

I was invited by your secretary to prepare a paper for this meeting, which I naturally consider as a personal compliment. I was also permitted to select my subject, and having attended a number of similar meetings, I am of the opinion that the amateur is somewhat neglected. Generally the papers and lectures are a little too advanced for him, so I decided to let him get technical data and instructions from text books, and I would call his attention to a number of things he should and should not do.

Don't attempt to get into the bee business in a rush. Take time enough to learn the business or your mistakes will be so numerous that you will become discouraged. Most amateurs attempt to make increase too fast. In so doing they weaken their colonies to such an extent that too many bees are lost during the winter. In the following spring they are usually about where they commenced, which to say the least, is a disappointment. Go slow and learn how and when to increase. As a rule it is better for a beginner to confine himself to producing honey. Sell the honey and buy bees for increase. This will give him an opportunity to study the bees and then he can make increase at a time when it will cost him nothing, and rather, be a benefit to his honey crop.

Don't be led astray by the stories of men who imagine they are beekeepers. In later years you can look back, as I have done in several instances, and see that they knew but little more than yourself, but were simply passing around information which generally turns out bad in the end.

Get some good text books and study them carefully. Then apply such information to your work. Don't try two or three men's ideas at the same time. Any one of them perhaps, would bring you out to success but mixing them usually proves disastrous. For instance, Mr. Doolittle in his method of working bees, tells us to have the hives full of honey in the spring, and the bees will take care of themselves. On the other hand, Mr. Alexander, who is equally as good an apiarist in every way, tells us that the key to success in honey production is spring, or stimulating, feeding. He says it is a good plan to extract all the honey in the brood chamber after the 15th of May, and feed it back. Now either of these plans will lead you through the season to a honey crop, but if you mix them, you may do the wrong thing at a time when it would prove to be worse, than to have left the bees alone. Never do anything to the bees unless you know why you are doing it. Anything you do to the bees is wrong unless you know the reason for doing it, and what you may expect from the manipulation.

Don't make the mistake that is very often made by beginners, of trying every sort of hive on the market. Take some successful beekeeper as a guide in the kind of apparatus to use, and have everything in your yard interchangeable, so that any piece you pick up will fit on any hive in the yard. It is very disagreeable, when you are in a hurry, to find that your hive and super are not the same size. You have to hunt up another super, or perhaps you have none in the apiary to fit, and the loss of time and the worry will make you wish you had paid strict attention to this matter.

Don't attempt to raise queens before you have made a success in raising bees. You must first know how long it takes an egg to batch, how long it is in the larval stage, the length of time in passing from an egg to a bee, how long to hatch drones, and how long to hatch a queen and then you must know under what conditions the bees will raise good queens. Good queens are the foundation to a successful apiary, and as a rule, I think for a time it will be to your financial advantage to buy your queens from some reliable breeder.

Don't take any chances with bee diseases. American and European Foul Brood are so widely spread over the country that every bee-keeper must be careful. Every slight mistake may cause you a great deal of work and perhaps the loss of your little apiary. Never leave any honey where the bees can get it, as this is the way the disease is transmitted from one colony to another. Study up on this subject carefully, and I repeat emphatically, *take no chances*. If you discover this dreaded disease in your yard, don't become discouraged. Clean it up by following carefully every detail of the instructions for curing the disease, and you will soon come to the conclusion that it is not so bad after all. Frequent and careful inspection is the secret of success in handling this disease. It has one advantage, it soon puts the careless, slouchy beekeeper out of the way, so it has a bright side after all.

Don't worry over reverses. We all have them. Just brace up and go at it a little harder. Hard winters and bad seasons are the exception rather than the rule of this locality—there is more sunshine than cloudy weather, and if you stick to your business, I am sure you can make it pay you a good living with less labor than anything you do on a small capital. An amateur beekeeper is not a commercial beekeeper, but he should be a faddist in every sense of the word, and if so, his enthusiasm will be unlimited, and he will become a commercial man later on. If he is of the right material, he will want to talk bees in preference to anything else.

The amateur should study all the phases of putting his product on the market, to entice the purchaser to pay him the maximum price. Cleanliness and attractiveness will accomplish this. The containers and labels should be tasty, and show your product off to the best advantage. For instance, a purchaser is willing to pay a little more for honey in a nice glass jar than in a tin can. He wants to see what he is getting for his money. Amateurs are usually dependent on the local market and a man's success depends largely on his reputation, so he must never sell anything as first class unless it is. Better tell the customer it is a little off, but the best you have at the time. Have him taste it, and usually he will buy and be perfectly satisfied.

Amateur beekeepers are usually the ones styled "Back Yarders" by the bee journals, but these are the ones who are the originators of most of the inventions used by the larger men. The back yarder is constantly studying the bees, as they are his hobby and he often stumbles onto some excellent appliances.

There is one thing he should never overlook if he is a town beekeeper, and that is, to be in good standing with his neighbors. The best way to do this is to sweeten them. When the honey is taken off, give nearby neighbors a generous sample, and always send the finest you have. This will sweeten their disposition towards the bees, and will make them good boosters for your product.

When the man with a few bees gets a good crop, it frequently happens that he becomes afraid of not being able to sell out, and cuts the price, or does not keep posted on the market and sells his goods too cheap. A man told me only a few days ago of buying three hundred as nice sections as he had seen, at 20c and at the time the market was $8.00 per case, or 33⅓c. Now this man not only lost the difference but spoiled the market.

Make preparation in the winter for the coming season. Don't be afraid of having a few more supplies than you would ordinarily need. They will not spoil, and if the honey flow is good, you will need them, and if you did not have them on hand, perhaps you would lose more honey than would have paid for the extra supplies, or perhaps the bees will swarm for lack of room. It is a great annoyance to be short. I know, for I have experienced it. Usually at such times when you send a rush order to the supply house, the goods come in bad order, are delayed in transit, or the order is mixed up, so that you can't use them, and then you are liable to say things which I will omit.

The things that I have referred to in this paper are things that most men know, but don't think about, and I am merely calling your attention to them as an evangelist calls attention to your sins, so that you may be benefited in the future.

STATE OF IOWA

1920

REPORT OF THE

STATE APIARIST

FOR

The Year Ending December 31, 1920

Also Report of the Convention of the Iowa Beekeepers' Association in Council Bluffs, November, 1920

F. B. PADDOCK, State Apiarist
Ames, Iowa

Published by
THE STATE OF IOWA
Des Moines