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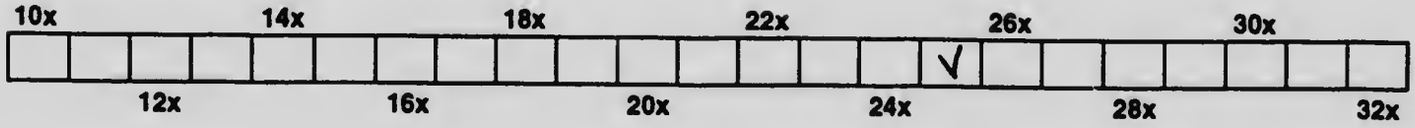

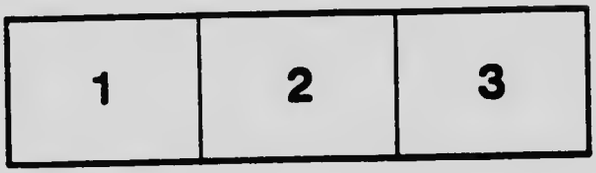

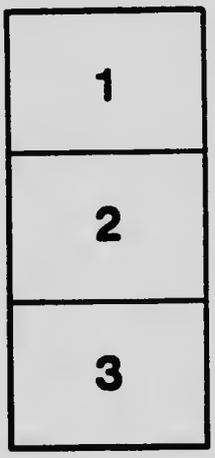

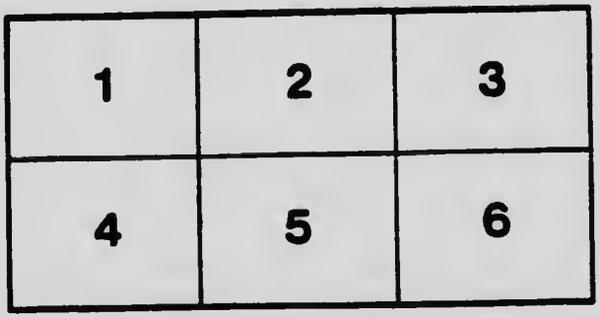

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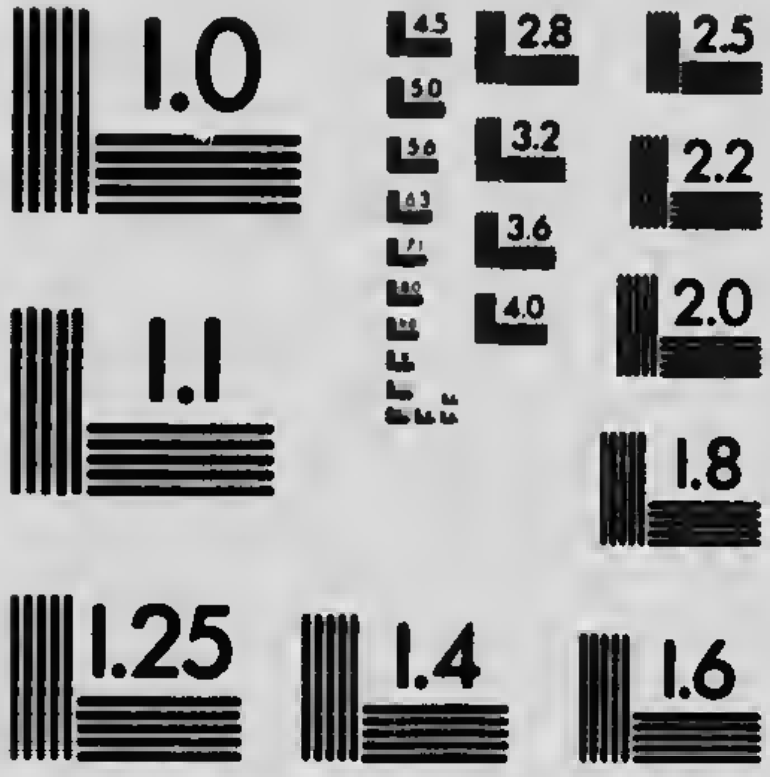

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DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS

DIVISION OF ENTOMOLOGY

Bulletin No. 2

THE HONEY BEE

A Guide to Apiculture in Canada

BY

C. GORDON HEWITT, D.Sc.

Dominion Entomologist.

BULLETIN No. 69

Published by direction of the Hon. MARTIN BURRELL, Minister of Agriculture, Ottawa

OTTAWA
GOVERNMENT PRINTING BUREAU
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To the Honourable

THE MINISTER OF AGRICULTURE,

Ottawa.

SIR;—I beg to submit herewith for your approval Bulletin No. 60 of the Experimental Farm Series (and No. 2 of the Division of Entomology) entitled: "The Honey Bee, a Guide to Apiculture in Canada" prepared by Dr. C. Gordon Hewitt, Dominion Entomologist.

The increasing demand for information on matters in connection with bee-keeping indicates the growing importance of this industry in Canada. The fact that the information asked for is frequently very general in character has seemed to point to the advisability of issuing a publication such as the accompanying bulletin, where the various problems likely to trouble the beginner or occasionally even the more experienced apiarist, are briefly and simply discussed.

The importance of the honey-producing industry, while to a certain extent recognized, is not yet really appreciated in Canada, and it is hoped that one effect of the wide distribution of this bulletin will be the still further popularizing of this most interesting and most profitable business.

In the beekeeping industry, as in most others, there are many difficulties. One of the most serious dangers in Canada as elsewhere at the present time is the prevalence of Foul Brood Disease. Regulations enacted by the different provinces with a view to the control and ultimate eradication of this disease differ somewhat and it has been thought advisable to include the text of the Ontario, Quebec and British Columbia Acts so that beekeepers in different parts of Canada might have an opportunity of becoming familiar with their own local laws on this subject.

The including of these regulations, together with the full discussion of the disease and the methods of eradication, should do much to help combat this, one of the most insidious as well as one of the most fatal diseases known.

I have the honour to be, Sir,

Your obedient servant,

J. H. GRISDALE,
Director, Dominion Experimental Farms.

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CONTENTS.

INTRODUCTION.

There have been many signs during the last few years that bee-keeping in Canada is receiving greater consideration than previously. Notwithstanding such favourable signs there still exists a large proportion, too large by far, of farmers, fruit growers and others who do not realize the importance of the presence of bees on the farm, on the ranch and in the garden, and the value of their products. There are others who, although they may not be aware of the fact that bees are most valuable adjuncts to the farm and orchard, nevertheless would keep bees if they knew how to begin and continue. This fact is clearly indicated by the large number of letters which are continually being received, the essence of most of which is as follows: "I should like to keep bees and should be pleased if you would tell me how to begin and what to do." This bulletin has for its chief object the answering of these questions. It is not intended to be an exhaustive account of apiculture or of bees, but a guide to those whose knowledge of bee-keeping is limited or who have no previous knowledge of this profitable branch of agriculture. Not only has it been written as a guide to the beginner but also with the desire to increase the number of bee-keepers in different parts of Canada by indicating the advantages of bee-keeping and thereby awakening the interest of farmers and fruit growers to its advantages.

Briefly, the advantages of bee-keeping are as follows: Bees produce an article which is of value as food for the owner and his family or as a saleable product and in the gathering of the nectar from the flowers they increase the yield of the crop whether it be clover or apples. Honey is valuable as an article of food and there is always a good market for it. The fertilizing value of bees in relation to flowers will be discussed later, but it should be remarked here that in many localities alsike clover is a total failure and hardly worth cutting owing to its seedless condition brought about by an absence of bees which alone fertilize the flowers. All fruit growers know that certain varieties of apples, plums and other fruits will not produce unless they are cross-fertilized. In such cross-fertilization, bees are the most important agents. The presence of bees, therefore, in an orchard undoubtedly increases the amount of fruit produced and this has been experimentally proved. It will be readily understood that a few hives of bees form an important and, we should think, an almost necessary adjunct to the orchard. Few people realize the enormous waste of nectar which takes place annually and which might be gathered, or appreciate the amount of clover seed and fruit which is lost each year owing to lack of bees to fertilize the flowers. Hence such a waste and loss continues. Canada is incomparable in its wealth of wild and honey producing flowers which give so great a charm to the landscape and yet their fragrance is wasted and they solicit in vain the visits of the bees.

Apart from the importance of keeping bees to ensure the fertilization of flowers, the results of their toil may be made very profitable to the owner. He may either use the honey at home or sell it. There is an increasing number of bee-keepers who devote their whole time to the production of honey. It is estimated that the average production from a single hive is 25 to 30 lbs. of honey in the comb or 40 to 50 lbs. of extracted honey. If sold at retail prices the honey in the comb will bring 15 to 25 cents per pound and extracted honey from 10 to 20 cents per pound. The price varies according to the class of honey and the market. The wholesale prices are less, 6 to 10 cents being paid for extracted honey and 10 to 15 cents per pound for comb honey. From these

returns the working expenses must be deducted. Such expenses are entailed by the provision of wax foundation, sections, etc. Many farmers may not know that a steer costing about five times as much as a hive of bees, after it has been fed and cared for during the whole of the winter, will not realize much more than the produce of a hive of bees in a single season, and that bee-keeping when properly carried on may be as profitable as the feeding of steers. It must not be imagined that bee-keeping requires very little attention. While it is true that where a few hives are kept to provide honey for the household, or as cross-fertilizing agents in the orchard, comparatively little attention is required, it is a mistake to imagine that large returns will reward the expenditure of little time and trouble. The successful bee-keepers are those who give much thought, time and labour to their bees. Where they are kept on a large scale this is necessary; there are good years but there are also years when, through drought or other causes, the honey crop is a failure and it is only the careful bee-keeper who is able to make the best of such poor years.

In Canada the most important problems confronting the bee-keeper are the control and prevention of bee diseases and the swarming and wintering of the bees. All these difficulties, however, can be overcome. Mr. Morley Pettit, Provincial Apiarist, of the Ontario Agricultural College, informs me that an increasing number of men and women in Ontario are making good incomes from bee-keeping alone. These incomes range from $500 to $3,500 per annum.

A large outlay of money is not required to begin bee-keeping. It is a mistake to start on a large scale with a large number of hives. Begin with one or two hives and increase the number annually as experience is gained, otherwise financial loss may occur and discouragement surely follow.

Wherever it is possible, the prospective apiarist should make the acquaintance of an experienced bee-keeper. This does not mean one who still employs antiquated methods such as keeping the bees in box or frameless hives, etc., but a bee-keeper who adopts the methods best suited to the production of honey and the welfare of the bees. Experience is the chief guide and, although much may be learned from books, the real knowledge is gained only by finding things out for oneself.

HOW TO BEGIN.

The best time of the year to commence bee-keeping is in the spring, during the month of May. The prospective bee-keeper should carefully consider first the question of the location of the apiary, the equipment necessary to begin with and should know something about the bees. All these subjects will shortly be dealt with. In procuring the bees there is an alternative. A single colony or several colonies complete in the hives may be purchased, or a swarm may be obtained from a neighbouring bee-keeper to whom a new hive has been supplied in which to hive the swarm. If it is desired to have much surplus honey in the first year, the former method is the better as it will not be wise to take much surplus honey from the swarm unless it is an early one and the season exceptionally good. Whichever method of procuring the bees is adopted, the greatest care must be taken that the apiary from which they are obtained is free from disease. This is especially important in localities where the diseases are prevalent. It is sometimes convenient and cheap to buy a colony in a box hive. In such a case they should be transferred to a new movable frame hive according to one of the methods described later. In no case should the bees be retained in box hives.

LOCATION OF THE APIARY.

In the selection of a place to locate the bees, two points must be considered, first, whether the situation is suitable for the hives, and second, whether the locality is a good one for bees. The latter question is important, as it is useless to endeavour to keep bees, that is in a profitable manner, in a locality in which nectar-producing flowers are scarce. In most localities there is an abundance of bee-forage but there are some regions where the production of surplus honey will not be great. One to two miles is the range of a bee's flight and this fact should be remembered when choosing the pasturage. In most parts of Canada a northerly slope is desirable if the ground is undulating. Low or swampy ground should be avoided. The hives should be protected from the prevailing winds and especially from high winds. For this purpose, a shelter fence may be erected or preferably a shelter hedge planted. Often it may be an advantage to have the hives shaded but too much shade is a disadvantage and may cause the bees to become irritable. When the hives are painted white they may stand in the direct sun if there is no slight shade. If tall trees are near the apiary there will be a danger of the bees swarming on these, from which their recovery will be difficult. It is not advisable to locate the apiary too near to a public highway if this can be avoided.

The hives should be placed so that the sun will strike them in the early morning and should not be placed on the west side of a building. Where a number of hives are kept they may be arranged in rows, the hives being about six feet apart and the rows about eight feet apart. This allows the bee-keeper room for the examination and manipulation of the hives without inconveniencing the adjacent ones. It also permits him to cut the grass, a most important essential in the apiary, where the grass should be kept as short as possible. Many bee-keepers prefer to have no grass underneath and around the hives and there is much to be said in favour of this plan: it frequently prevents the loss of the queen when the hive is being examined. It is not advisable to keep more than one hundred hives in a single apiary. Where the number is greater there is a danger of overstocking the locality with bees. The professional bee-keeper usually starts 'out-apiaries' in localities which are in convenient communication with the home apiary and where the supply of nectar-producing flowers is good. Such a branch or out-apiary should not be within a radius of two miles of the home apiary, or of the next out-apiary if a large number of hives are kept in each.

EQUIPMENT.

In purchasing equipment and bee supplies the golden rule is simplicity with good workmanship. A large amount of equipment is not necessary to begin a small apiary and the additional requisites can be obtained as they are needed.

It is advisable to have an outbuilding in which to store the apparatus and supplies, to extract and make up the honey and to carry on the other operations connected with the production of honey and wax. The windows of such a bee or honey house should be screened to prevent the entrance of the bees but provision should be made at the top of the windows or door, for the escape of any bees which may have entered inadvertently. This building may be fitted up with a work bench and shelves for storing supplies such as honey bottles, sections, etc.

HIVES.

It has been stated already that bees should not be kept in box hives and no bee-keeper at the present time would think of keeping bees in straw skeps. Both of these old methods are wasteful, one might almost apply the word criminal to the method of obtaining honey from these hives, namely the destruction of the bees by means of sulphur fumes. The object of the bee-keeper is to keep the bees in such a way as to be able to manipulate them in any manner he may desire. This object, to a large extent, is attained by persuading the bees to build their combs in movable frames which can be lifted out of the hives. A hive containing frames of this nature is known as a movable frame hive. There are many forms of frame hives, each with enthusiastic supporters, but there is only one hive which may be said to have a world-wide reputation and to have been adopted in all countries. This hive, which is now most generally used, is known as the Langstroth hive, having been devised by Langstroth in 1857.

The Langstroth Hive.

The Langstroth hive consists of a wooden box with a loose bottom and a top which constitutes the roof of the hive. (Plate I. Fig. 2.) In this hive the frames containing the combs are suspended on rabbets so that they hang free in the hive and do not touch the tops, sides or bottom. A space, the bee space, is left for the passage of the bees round the sides and bases of the frames. The Langstroth frames measure 9¼ inches deep and 17⅝ inches long. This size is most commonly used but other sizes occur in other makes of hives. It is important that a standard size of frame should be adopted and used throughout the apiary, otherwise the frames of different hives will not be interchangeable. This ability to interchange the frames of the hives is essential as it is often necessary to transfer the frames from one hive to another; this would be impossible if different sizes were used. Most of the hives in common use contain eight or ten frames and it is not advisable for the beginner to adopt a size containing a greater number. The above constitutes the single storey hive and forms the brood chamber (B) in which the bees are reared and honey for their own use is stored. For the production of surplus honey another storey is added above the brood chamber. This is known as the super (D). If it is desired to obtain honey in the comb, the super is a shallow one and contains sections which will be described later; if extracted honey is required, the super is fitted with frames which may be either shallow or of the same size as those used in the brood-chamber. Between the brood chamber and the super, a "queen-excluder" (C) is often used.

The roof of the hive (E) should fit well and be absolutely watertight. It is an advantage to have it slanting slightly and ventilated. Like the rest of the hive it should be painted white. Hives should not be painted a dark colour. It is not advisable to have the bottom board of the hive permanently attached. It should be loose in order that the hive may be raised from the bottom board by small blocks when this may be necessary, as is the case when wintering the hives in the bee-cellar and in following one of the methods of preventing swarming. The hive is always placed on a stand to elevate it a few inches from the ground; if possible, each hive should be on a separate stand for convenience of handling both hive and bees. Various kinds of stands are used; they may be of wood (A), bricks or tiles, etc.

QUEEN EXCLUDER.

This is a sheet of zinc with perforations of a definite size, large enough to permit the passage of the workers but too small to allow the passage of the

queen, with the result that the queen is prevented from travelling into the super to deposit her eggs from which brood would be produced. Where extracted honey is required, the presence of a queen excluder may be desirable. It should be mentioned, however, that there is great diversity of opinion among bee-keepers as to the use of the queen excluder. Those against its use maintain that it prevents the perfectly free passage of the bees into the super and hinders the proper ventilation of the hive with the result that the activity of the bees is lessened and many bees are employed ventilating the hive when they might be gathering honey; there may be also a tendency for bees to store the honey in the frames of the brood chamber instead of in the super and in this manner fill cells which should be used for brood rearing. Until the beginner is adept in the manipulation of the bees and has a good knowledge of their habits it is advisable for him to use the queen excluder. He can discard it later if necessary.

SMOKER.

To enable one to handle the bees, some method must be adopted to pacify them. This is effected by means of a few puffs of smoke sent in through the entrance and underneath the corner of the quilt covering the frames. For this purpose a smoker is required. It consists of a tin chamber attached to a pair of bellows. To use it, the top is taken off and dried wood, or lightly-rolled pieces of old sacking, are ignited at one end, this end is put into the smoker first and the lid is then fastened on. A few puffs with the bellows will start the smoker which, while in use, should always stand the right way up; when laid upon its side it usually goes out.

VEILS.

To create confidence in handling the bees, a veil is especially useful to the novice. Various forms are made. It should be of a light and durable material such as Bruxelles net. The upper end is fastened by means of elastic round the crown of a straw hat. The lower end should be loose to allow the veil to hang away from the face and may be tucked inside the coat collar. Bee gloves may be used by the beginner.

A most useful instrument is a hive tool. This tool is shaped at one end for prying open the hive, moving the frames when they are stuck, etc., and at the other for scraping. A long screw-driver will answer the same purpose very well.

BEE ESCAPE.

This is a small trap-like apparatus which is fixed in the middle of a board large enough to completely cover the underside of the super. It enables the bees to leave the super and prevents their return. On this account, it is used for clearing the bees out of a super prior to its removal from the hive.

FEEDERS.

There are many kinds of feeders employed in feeding the bees, which is often necessary especially during the fall prior to wintering or in the spring. The description of the various types, many of which can be made by the bee-keeper himself, will be found in catalogues of bee-keeping supplies, and further reference will be made to them later. (See FEEDING.)

Too much space would be required to describe the other equipment which the bee-keeper, as he increases the number of his hives, will require. If extracted honey is desired, an extractor will be necessary and a wax extractor for extracting and melting down the wax from old combs, etc. He will also require a wire imbedder for fixing the wax foundation in the frames, an uncapping knife for uncapping the combs before the extraction of the honey and a few other small articles which he will note on consulting a catalogue of bee-keeping supplies.

THE BEES, THEIR HABITS, DEVELOPMENT AND PRODUCTS.

RACES.

The common race of hive bee, usually known as the Black bee, was introduced into North America from Europe many years ago, probably about the seventeenth century. In addition to this common race, however, a number of other races have been imported.

The Italian bees were introduced into the United States from Italy in 1860. They are readily distinguished by the golden yellow banding of the abdomen. On account of their excellent qualities they are replacing the common black race, compared with which they gather honey more rapidly. They winter well, are easily handled and maintain their colonies in excellent condition.

Carniolan bees are from the Alpine region of Austria and are noted for their gentle habits. They are larger than the Black bee, of which they are a grey variety. They have a great tendency to swarm, especially in hot localities, and this is a disadvantage. Very little propolis is used by this race.

Caucasian bees, which closely resemble the Black bee, are considered the gentlest of all the races. Opinions differ as to their honey-gathering qualities. They swarm readily and gather large quantities of propolis, both of which are undesirable qualities.

Other races, such as Tunisians, Syrians and Cyprians have also been tried but they have not met with the approval vouchsafed to the aforementioned races. Of all the races, Black and Italian, and also hybrids between the two, have found most favour among bee-keepers. The beginner is recommended to start with Italians in preference to any of the others.

THE BEES.

In a strong, healthy bee community there are three classes of individuals, a single queen, from 30,000 to 40,000 workers, and a varying number of drones.

The Queen (Fig. 5*b*.) may be distinguished from the workers by her greater length and more slender shape. Compared with the length of her body, her wings are shorter than those of the workers. The queen is the most important individual in the hive. She is responsible for the production of the eggs from which the brood hatches and is cared for by the workers. In the height of the honey season she may lay as many as 3,000 eggs in a day, a fact which it is necessary to remember. In the production of a queen, the workers select an ordinary worker egg, frequently in a cell at the edge of the comb. This cell is enlarged and a thick wall, pitted with hexagonal cavities on the outside, is built up to form the large queen cell (Fig. 6.). When the egg hatches, the larva or "maggot" of the bee is fed upon specially prepared and rich food; this is characteristic of the special attention she receives throughout her life. One queen only is tolerated in a hive and if the young queen has escaped destruction in the queen cell before emergence, by the old queen, there may be either a battle royal or the old queen may leave the hive with her retainers in the form of a swarm. A few days after emergence the young queen leaves the hive on her nuptial

flight, on which occasion the drones find the only reason for their existence. One drone is successful at the cost of his life and the queen returns to the hive fertilized for the rest of her life, which may be as long as five years. She is most prolific in the second and third years. After that time she could be replaced. She lays eggs which may produce workers or drones.

FIG. 5.—The honey bee: *a*, worker; *b*, queen; *c*, drone; twice natural size.
(*Phillips, Farmers' Bull. No. 447. U.S. Dept. Agric.*)

The Workers (Fig. 5*a*.) are really sexually undeveloped females. They carry on all the activity of the hive; the gathering in of supplies, the storing of these, the building of the comb, the care of the brood and of the queen; they take care of the hive, which involves cleaning, closing up the crevices, ventilating it in the summer and defending it. They are the smallest of the three individuals and at the same time the most specialised structurally, to enable them to carry out their varied functions.

The Drones (Fig. 5*c*.) are the males of the colony and usually appear at the beginning of May. Their only function is to ensure the fertilization of the queens. They lead an otherwise useless life and at the end of the summer are forcibly expelled by the workers from the hive, usually more dead than alive and not always entire.

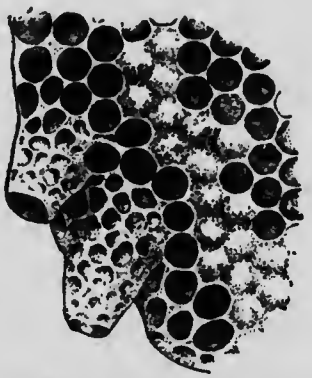


FIG. 6.—Edge of comb showing two queen cells.

The stages in the development of the different individuals are the same although the periods occupied in development vary. The small, white egg is

deposited by the queen at the bottom of the cell, if it is a drone cell it will produce a drone. Three days later it hatches and the minute, white larva or grub is fed by the workers on honey and pollen until in five or six days it is full-grown, at which stage it fills the whole cell. The workers now seal up the cell by means of a wax cap and the larva spins a fine, silken cocoon. The skin is then shed for the last time and the larva changes into a creamy-white pupa in which the parts of the future bee can be recognized. When the development is complete the perfect bee cuts the cap of the cell in which it has developed and emerges. The young worker bees act as nurses to the brood before they become honey gatherers for the hive.

The approximate time which the development of the different individuals takes is shown in the following table:

	Eggs	Larva	Pupa	Whole Development
Queen	3 days	5½ days	7 days	15½ days
Worker	3 "	5 "	13 "	21 "
Drone	3 "	6 "	15 "	24 "

THEIR HABITS.

It is important that the bee-keeper should carefully study the habits of the bees, as their successful management and manipulation depend chiefly upon a thorough knowledge of them. It is a mistake to suppose, as many do, that the chief characteristic of a bee is its sting. If manipulated with proper care and consideration for the bees, the chance of being stung is reduced to a minimum. Hives should be examined during the day while the bees are working; they should be disturbed as little as possible, especially on dull days or when rain threatens for at such times the bees are likely to be most irritable. They should not be examined at night and only when necessary at other times; else the most sweet-tempered bees will have their characters changed. Rapid and jerking movements should be avoided. When examining hives, do not keep them open too long and avoid examining, as much as possible, if the weather is cold, or the brood will tend to be chilled, as the temperature of the hive is higher than the outside temperature. Bees dislike black and it is preferable to wear light clothes in the apiary. Before opening the hive for examination, a few puffs of smoke should be sent into the entrance; when the cover is removed the quilt should be raised at one end and a few more puffs directed down between the frames. This causes the bees to gorge themselves with honey, in which state they are more tractable. The hive should not be jarred in any way and all operations should be carried on from the side or back of the hive so that the free flight of the workers is not prevented in the least. If a few inquisitive bees appear to desire a closer acquaintance, do not strike at them. It is not always possible to avoid stings. After being stung, remove the sting together with the poison gland which is usually left behind, taking care not to squeeze the latter, and if the wound is not rubbed the irritation will be less.*

HONEY.

Honey is the nectar obtained from flowers, which has been modified by storage in the honey stomach of the bee and is stored in cells of the comb as food for the colony. When it is collected from the flowers, the honey is a thin, sweet solution. In the body of the bee, it undergoes concentration and thickens, and formic acid, secreted internally by the bee, is added as a preservative before the

*The pain may be relieved very often by the use of a solution made as follows: one ounce of petroleum, 30-40 grains of iodine.

honey is stored in the cells of the comb, where it is sealed after ripening. Honey may vary in flavour and aroma and also in colour, according to the flower from which the nectar is obtained. The amount of water and of the sugar compounds, such as dextrose and levulose to which the properties of the sugar are due, also vary. White clover honey is generally taken as the standard light-coloured honey. Similar light-coloured honey is obtained from other clovers, basswood, Canada thistle, willowherb, wild raspberry etc. Amber honey is obtained from asters, goldenrod, sumac, milkweed, etc. Dark-coloured honey is obtained from buckwheat, and, although this honey is inferior in quality to clover honey, it is produced late in the season and is readily sold on the commercial market.

Honey is an excellent food and being partially digested, as it were, is most readily and easily assimilated by the system. Confectioners and bakers use it in preference to sugar to give cakes, etc. their keeping qualities. In the sweetening of cakes and bread it is superior in many ways to sugar.

WAX.

Next to honey, wax is the most important of the natural products of the bee. The wax is secreted by glands underneath the abdomen, or hind body of the bee, in the form of small scales or plates which, as they increase in size, project from beneath the abdominal segments on the ventral side. The worker bees only produce wax and a high temperature is required for its production. It is elaborated by complex physiological processes from honey and it is estimated that about fifteen pounds of honey are required to produce one pound of wax. The value, therefore, of providing the bees with foundation and empty combs for honey storage will be readily

COMBS.

The combs are the cradles and at the same time the storehouses of the bee community. In the cells which make up the comb, the brood is reared to maturity and the honey is stored. The cells constituting the comb vary in size. They are regular and hexagonal in shape. The majority are worker cells; there are twenty-nine of these to the square inch and five to the linear inch. Larger cells are made for the drones; of these there are four to the linear and eighteen to the square inch. The character of the large, irregular queen cell has been described already.

POLLEN.

Frequently, bees may be seen carrying large, yellow, brown or orange-coloured masses in their hind legs. These are masses of pollen which is the bread of the bees and constitutes, with honey, their food. It is the fertilizing product of the flowers and is the toll which the bee takes for carrying a portion of the pollen from flower to flower in its valuable rôle as a cross-fertilizer. In its visits to flowers, the body of the bee becomes dusted with pollen which is removed by most beautifully-constructed combs inside the enlarged joints of the hind legs and collected in small pollen baskets formed by large curled hairs on the leg-joints. Many other peculiar structures go to make up the pollen-gathering apparatus in the hind legs of the bee, but lack of space forbids their description here. The pollen is carried to the hive and removed from the legs of the bee into one of the cells in which it is stored as food for the growing larva.

PROPOLIS.

This is a dark, resinous material collected by the bees from the buds and other portions of various trees. It is carried in the pollen baskets on the bee's legs and is used as a cement or glue to fasten loose portions of the hive and to

fill crevices. Its sticky character makes its presence a nuisance in the hive. It can be removed from the hands by means of alcohol, gasoline or benzine, etc. Clothes and equipment may be cleaned by boiling in lye.

THE MANAGEMENT OF THE BEES.

Reference has already been made, in discussing the habits of the bees, to the necessity of a thorough knowledge of their behaviour and in this connection certain principles of conduct were laid down. These principles should be carefully borne in mind in handling the bees.

In opening the hive, the smoker should be used according to the directions already given. When the quilt which covers the tops of the frames is carefully removed, a few puffs of smoke are directed on to the tops of the frames. The frames should be loosened gently at both ends by means of the hive tool or a screw-driver. The division board which acts as a movable side and is used in contracting the space within the hive is now removed, or, if there is a space, it is moved away from the frames, thus permitting the side movement of the frames. If the frames occupy the whole hive space and there is no division board, one of the end frames is removed and gently placed in an upright position against the side of the hive. Before a frame is removed it is advisable to move the adjoining frame a little to one side; this prevents any crushing or brushing of the bees. The frame upon which the queen is working should not be placed on the ground or the queen may wander away. In examining the frames, great care must be taken that the queen is not dislodged from the frame upon which she happens to be, as the loss of the queen will seriously affect the welfare of the hive.

To examine a frame, lift it directly out of the hive, holding the upper bar in a horizontal position. It should be held over the hive if possible in order that any bees or honey falling off the comb may fall directly into the hive. To examine the reverse side of the comb, do not swing the frame round or the strain caused by the weight of the comb may result in its breaking, especially if the comb is not wired. Lower one end of the upper bar until it is perpendicular and revolve the frame on this axis until the other side is seen, when the other end of the upper bar is lowered bringing the upper bar into a horizontal position and beneath the comb.

In replacing the frames, care should be taken that they are properly spaced; they must not be placed too wide apart or the bees will fill the space with comb, or too near, else the bees will not be able to work the cells. Many frames are provided with self-spacing devices; when these are not provided, the frames should be placed so that they are 1⅜ inches from centre to centre.

UNITING.

Colonies sometimes become very reduced in numbers or queenless and in order to save them it is necessary to unite them to strong colonies. It is especially important in the fall to examine all the colonies to ascertain if any are weak. Such weak ones should be united and fed in order that they may winter in a strong condition with plenty of young bees. Different colonies of bees have characteristic odours which the bees recognize and under ordinary conditions two weak colonies cannot simply be placed together. If two colonies are to be united, the weaker colony should be gradually moved at the rate of about one foot per day until it stands by the side of the stronger colony. If both colonies have queens, the queens should be caged and the better queen should be left in her cage for thirty-six or forty-eight hours until the strange bees are accustomed to her, when she may be released. Sometimes she may be killed, in which case the reserve queen should be introduced as described. Before

FIG. 2.—Movable-frame hive showing parts: A, stand; B, body of hive or brood-chamber; C, queen-excluder; D, super containing sections; E, roof.

FIG. 1.—Hive open for examination.

uniting, both colonies should be strongly smoked. The frames from the weak hive are then placed in the stronger hive and the old hive of the weaker colony is removed. It is advisable to put a large slanting board leading to the alighting board which will enable the new bees to recognize their new hive more readily at first; it may be removed later. About half an hour after uniting, the bees should be examined and, should they seem to be very quarrelsome, another vigorous smoking should be administered. When bees are united during a succession of cold days, that is, when they are not flying, they can usually be put together at once, and it is not necessary to move up the weak colony gradually. It is preferable to unite during the honey flow ; uniting in the spring is not usually recommended.

New swarms may be united without any difficulty by simply throwing them together in front of a new hive as if a single swarm were being hived. Often a colony which has been queenless for a short time may be united to a stronger colony by treating it like a swarm and simply shaking it out in front of the strong hive after having strongly smoked both the colonies previously.

TRANSFERRING.

The prospective bee-keeper may have obtained his first colonies of bees in box hives or a bee-keeper may wish to increase the number of his colonies by purchasing colonies in box hives. In both these cases, the first step to be taken is to transfer them to a movable frame hive. There are several methods of doing this, but perhaps the best method from the point of view of the future is the following, as it ensures the bees starting with everything in good condition:

A new hive containing frames fitted with full sheets of foundation is placed on the stand previously occupied by the box hive which is moved a little to one side. After smoking the bees, the box hive is turned bottom side upwards and an empty box is inverted over it. By drumming vigorously on the sides of the box hive by means of two sticks or the palms of one's hands, the bees are driven out of the box hive up into the box, where they will cluster. When they have all left the old hive they are shaken out on to a board covered with a white cloth, or newspaper, placed in front of and reaching up to the entrance of the new hive into which they will immediately run. A careful watch should be kept to see that the queen enters the hive, otherwise the transfer will be a complete failure. The old box hive is now placed on a new stand and left for three weeks, at the end of which time all the brood will have hatched out, and these bees may now be united to the colony in the new hive. A number of queen cells may have formed in the interim and in case any young queens should have been reared, a queen and drone trap is placed over the entrance of the new hive or a piece of queen-excluding zinc to prevent the entrance of the young queens when the young bees in the old box hive are shaken out in front of the new hive and united to the original colony.

In another method of transferring, the combs are also transferred. A new hive is set on the old stand and the bees are drummed out of the box hive into a box as already described. The frames of the new hive are not fitted with wax foundation, as the old combs containing the brood and also some honey are to be transferred. After the bees have been drummed into the empty box take off one of the sides of the old box hive and cut out the combs one by one. By cutting them to the necessary size they are fitted with the new frames in which they are held in position by tying two bands of string round the frame with the comb in position. Great care must be exercised that the brood is not injured by pressure of any kind during the process of cutting out and fixing the combs, and that the combs are the same way up in the new hive as in the box

hive. The frames containing the old combs are now placed on the new hive and the bees are thrown out in front of the hive as described already and allowed to run in and take possession of their old furniture in a new house.

In the case of bees which have been found in a tree they may be transferred often by drumming into a box and hiving in the usual way after cutting out the combs and fixing them into frames.

Bees may be transferred at any time of the year when the honey flow is on; the best season in most parts of Canada is in the spring when the fruit trees are in bloom and this will enable the colony to get into good condition during the summer. When it is possible, the transfer should be made on a warm, fine day, preferable before noon.

RE-QUEENING.

The success of the hive depends upon the character of the queen, therefore the bee-keeper must keep a careful record of the age of the queens and their history, which is as important to him as the records of cattle or of horses are to the farmer. A queen should not be retained after the third season; many bee-keepers replace them after the second season. A young and prolific queen insures a strong colony. There are also other reasons than that of old age which may make the bee-keeper desirous of re-queening. He may wish to replace a Black queen by an Italian, which is always advisable; or the colony may have lost their queen for some reason or other. The loss of the queen is indicated by the extreme restlessness of the bees, especially during the evening when the other colonies are quiet; the queenless bees being found running in and out of their hive in an excited manner and buzzing with a peculiar note.

Queens may either be reared or purchased. If they are purchased they should be obtained from a reliable person and from an apiary free from bee disease; in any case it is advisable to destroy the workers which accompany the queen. Queens that are purchased are either "tested" or "untested." An "untested" queen is a young queen which has mated but has not been kept long enough to enable the producer to determine whether her offspring are pure bees, that is, whether she has mated with a pure drone. A "tested" queen is one the appearance of whose offspring has proved that she has mated with a pure drone. Queens may be sent long distances by mail. They are sent with a supply of candy and a few workers in small cages, the common form being the Benton cage which is so constructed that it can be used in introducing the queen. It is advisable, however, to transfer the queen into a new cage before introducing.

Before a queen is introduced into a colony having a queen which it is desired to replace, the colony must be made queenless by removing the old queen. This should be done about forty-eight hours before the new queen is introduced. If a colony has been queenless for about twelve to sixteen days it is extremely probable that there will be one or more virgin queens in the hive, if the colony is a strong one. These young queens must be destroyed, and the queen cells should be cut out. It is not advisable to allow the bees to be queenless for more than five days. Full instructions for the introduction of the queens, etc., usually accompany them when they are purchased. The introducing cage is placed on the top of the frames with the wire facing downwards. The entrance to the introducing cage is blocked with candy and covered with a piece of pasteboard when it is received. By gnawing away the card, the bees can eat the candy and thus release the queen, which should take place within twenty-four hours. Sometimes the bees will "ball" the queen when she enters the hive, in which case the ball of bees must be well smoked and the queen, which will be found in the centre, should be put into the cage and introduced again.

Where a colony has one or more young queens, for example in the case of the old queen having left with a swarm, they are more ready to accept a new

queen. After the queen has been introduced, the colony should be disturbed as little as possible, and only to see whether the bees have accepted the queen without balling her.

SWARMING AND INCREASE.

Perhaps no problem has occupied the attention of bee-keepers so much as that of the control and prevention of swarming. Swarming is a natural method of increase and is due chiefly to the overcrowded state of the hive and to the inability of the queen to lay, through lack of room. Other causes are also responsible. It is the object of the modern bee-keeper to prevent swarming as far as possible, or at least to keep it under control. The bees must be occupied in gathering honey rather than in raising undesirably large quantities of brood. If careful watch is kept, it usually can be ascertained when the swarm will issue. The swarm is composed of a large proportion of the workers of the colony led by the old queen. Before the swarm issues it will be found usually that the brood chamber is crowded and that there are a number of queen cells. The bees are quiet and remain noticeably inside the hive while the other colonies are working. When the swarm issues, it generally settles on the bough of a bush or tree near to the apiary, but in some cases it may fly across the country. If the limb of the tree is a small one and can be spared, the swarm is readily hived by cutting off the limb and shaking the swarm on to a white sheet or paper spread before the entrance of the new hive. In the new hive the frames may be supplied with full sheets of foundation and a single comb containing brood may be placed in the middle to make the bees feel at home. After the first swarm has issued from a hive, it is not unusual for secondary swarms or casts to come off. These should be prevented by carefully cutting out all the queen cells except one in the old hive after the emergence of the first swarm. If it is desired, a new queen may be introduced at this stage, as previously described.

The greatest trouble which is encountered in permitting bees to swarm as a means of natural increase is the frequent difficulty of capturing the swarm. It may travel some distance or it may collect in an inaccessible situation. A large number of bee-keepers prevent this by clipping the wings of the queen early in the season and this practice is to be recommended. In the spring the hives are carefully examined and, when the queen is found, the fore-wing of one side is carefully clipped by means of fine, sharp-pointed scissors. With practice, the operation can be performed without removing the queen from the comb. The result of this precaution is that, when the swarm issues, the queen cannot fly and consequently the swarm does not leave the neighbourhood of the hive, where the queen may be found, usually making ineffectual attempts to fly. She should be caged. The hive from which the swarm issued may now be removed to one side and a new hive containing a comb of brood set on the old stand. The swarm is hived in the new hive into which bees out in the field enter on their return; the queen is also released in the new hive with the swarm. The parent colony should then have all the queen cells, except one, removed as previously described, and the reduction in numbers caused by the bees entering the new hive on their return will usually prevent a second swarm or cast issuing.

Another method of preventing the swarm leaving the neighbourhood of the hive is to catch the queen, if she has not been clipped, by means of a queen trap placed in front of the entrance and proceed as in the case of the clipped queen.

PREVENTION OF SWARMING.

The principle adopted in the prevention of swarming is the removal of the causes which are responsible for the impulse to swarm. As already stated, the chief of these is the overcrowded state of the hive. Lack of ventilation is also

a potent cause. No single method may be said to be universally effective; different bee-keepers advocate different ones. The following are some of the systems which have been proven successful, but no one will be effectual if the bee-keeper does not use his own reason and apply the methods accordingly. If the hive is overcrowded with bees they must be given more space. If it is overcrowded with brood, or if the frames in the brood chamber are filled with honey and brood, the queen will be unable to lay and she must be given more room. Additional bodies may be placed over the brood chamber and it is advisable to separate them from the latter by means of the queen excluder, although its use is disputed by some bee-keepers. Fresh combs may be provided in the brood chamber and those frames containing brood and honey with a large proportion of the latter may be placed in one of the hive bodies above the excluder. Frequent extraction will give more storage room. By the provision, therefore, of more room for the queen to lay and for storage, especially if extracted honey is desired, swarming may often be prevented.

In addition, care should be paid to the ventilation of the hive in summer. This can be accomplished by propping up the front of the brood chamber from the bottom board by means of wooden wedges one inch in thickness. This not only assists in the prevention of swarming but also in greater honey production, since large numbers of the bees will not be compelled, as otherwise would be the case, to ventilate the hive. There are other methods employed for providing space below the brood chamber as a means of ventilating the hive and giving more room.

Colonies which have been re-queened in the spring with a young queen will be less liable to swarm than colonies with older queens and, from the point of view of honey production also, the plan of re-queening with a young queen in the spring is an excellent one.

It will be found that the above methods, or variants of the same, employed either singly or in combination, will materially assist in the prevention of swarming.

INCREASE.

The bee-keeper, if he desires, may forestall the natural swarming of the bees and obtain the increase in the number of colonies which he may require without the worries and inconveniences which natural swarming often causes. The simplest manner to increase, that is to make two colonies out of one, is to divide equally between the two hives the frames containing the brood and to give a young queen or a frame containing a queen cell to the queenless portion. The hives should then be made up with frames containing empty combs or full sheets of foundation.

One of the best methods of increase, especially where comb honey is being produced, is by shaking. This should be done preferably when the hive is full of bees and has a single super of sections on. The parent colony is removed from its stand and a new hive, containing frames fitted with strips of wax foundation one and a half or two inches wide, is set in its place. A frame containing unsealed brood should be placed in the middle, as this will serve to keep the bees in the new hive. The bees are now shaken off the frames from the parent colony into the new hive and the super with the bees it contains is placed on the new hive above a queen excluder. This will induce the bees to continue working. The parent colony may be re-queened with a young queen or allowed to re-queen itself which it will readily do, owing to the presence of a large amount of young brood.

THE PRODUCTION OF HONEY.

As the production of honey is the bee-keeper's object, everything must be done which will assist in obtaining the largest amount. The greatest essential is to have the hive full of bees when the first honey flow arrives, which is usually at the time of the fruit bloom. It is important to remember that the bees must be produced before the honey flow arrives in order that when the flow is on they may be gathering honey rather than consuming it, which would be the case if brood rearing were left until the first honey flow arrived. Early in the season, the bees are busy gathering nectar and pollen from the early flowers; the pollen is chiefly from the various kinds of willows; this is food for the young bees and should be supplemented, if necessary, by feeding. When the bees are strong in the spring they are able to make full use of these early plants which are essential to the production of brood and the building up of a strong colony. The honey is obtained from the bees either in the form of extracted honey or as comb honey, and the methods employed in the production of these two forms vary. In both cases, supers are put on top of the brood chamber with or without a queen excluder between the brood chamber and the first super. The supers are put on as soon as the hives are filled with bees and the frames with brood and honey. In some cases, in order to obtain a specially strong colony, a second brood chamber is placed on top of the original and the queen excluder is placed above the second tier. At the end of the season the queen is placed in the lower brood chamber with the queen excluder above this.

EXTRACTED HONEY.

For the production of extracted honey, the super is usually the same size as the brood chamber and contains an equal number of standard frames. Some bee-keepers use shallow frames for extracting, but the standard size is preferable and commonly used. When it is possible, these frames should be filled with empty comb as this enables the bees to immediately begin storing honey. In the case of the beginner, however, with a growing apiary, it will not be possible to supply empty combs in the supers and full sheets of foundation should be used. The foundation used in extracting frames must be wired, otherwise the combs will break under the strain of extracting. The wax foundation is fixed in the frames, either in grooves which are cut in the underside of the top bar in which it is held by means of a wedge, or by a wax foundation roller, a small wheel (a knife handle, which must be moistened, will accomplish the same end) which presses the wax firmly on to the wood of the upper frame where it is made still firmer by means of melted wax poured along the other side. In fixing the foundation, care must be taken that it is perfectly straight, otherwise the combs will be built in a crooked manner and the chief end for which frames and foundations are used will be defeated. By wiring the foundation it is not only kept straight but it is strengthened. In wiring, three or four horizontal strands of tinned wire (No. 30) are stretched across the inside of the frame. This can be done by piercing four holes through the end bars of the frame, the top hole being about an inch below the upper bar. The wire, when it has been threaded through these holes and across the frame, should be flat on the sheet of wax foundation into which it is now embedded by means of a spur embedder; this is a small wheel with grooved teeth.

When most of the frames in the extracting super contain capped cells, another super should be placed below the first one. The capping of the cells indicates that the honey is "ripe" Honey which is extracted from uncapped cells is "unripe" and should be ripened by artificial means In the process of ripening, a percentage of the water is evaporated and certain chemical changes take place in the sugar compounds. Where it is possible, it is preferable to

ripen the honey in the hive and extract only from capped combs. The bee-keeper may either remove the extracting super as soon as the honey in the frames is capped or he may tier up the supers and remove them at the end of the honey season. Where it is desired to keep the different classes of honey carefully separated, the removal of the supers as soon as they are filled is advisable. When a super is full and ready for removal, a bee escape should be placed underneath the super about twenty-four hours before its removal.

The full extracting supers are carried to the bee house, the windows of which are fitted with screens. Here the frames are taken out of the super and the cappings from one side are removed by means of the sharp uncapping knife which is warmed by being kept in hot water. The cappings fall into a tin or special strainer and the frame is placed in the cage of the extractor with the uncapped cells outside. The turning of the handle of the extractor causes the honey to be thrown out of the comb by centrifugal force and as soon as it is all removed from one side, the other side is uncapped and extracted in a similar manner. The empty combs are then ready again to be given to the bees to fill. If it is at the end of the season, they may be given in a super to the bees to clean up before they are stored away for use in the following season.

If the honey was all capped before extraction, it is ripe and may be put into bottles or cans soon after extraction, but it is always advisable to let it stand for a short time to clear before running it into the containers. It is best to keep it at a temperature which does not fall below 65° F. If it is extracted before it is ripe, it may be ripened by keeping it in vessels or fairly shallow tanks covered with porous material to permit the evaporation of the water.

COMB HONEY.

For the production of comb honey, shallow supers are generally used. In these the "sections" in which the combs are built are placed. The sections are made of wood and the common size measures 4¼ inches square. They are cut out of single pieces of wood which have V-shaped grooves to permit their being folded. The sections are fitted with wax foundation, preferably in full sheets, before being placed on the super and for this purpose "thin" or "extra thin surplus" foundation is used. A full section weighs about one pound. Greater care is needed in the production of comb honey than in working for extracted honey. The sections must be well filled and sealed over, the comb must be straight and the cappings must be as white as possible. If they are soiled, as they will be if the super is left too long on the hive, their value will be less. When most of the sections are capped over to the edge of the wood the super should be removed; the sections which are incompletely filled or contain partially built combs may be placed in the centre of the new super. When working for comb honey it is important to know when the different periods of honey flow occur, that is, the periods for the opening of the chief honey-producing flowers, in order that the bees may be made as strong as possible with a view to their making full use of the opportunities for honey gathering. This will result in a reduction of the number of partially filled sections. When most of the sections are capped over, the super should be raised and another placed beneath it, and when it is finished it can be removed, after clearing it of bees by means of a Porter bee-escape. A good section of honey should have practically all the cells filled and capped over to the outside adjoining the wood, the cappings white and the wood clean and free from propolis.

THE PRODUCTION OF WAX.

Notwithstanding the fact that wax is a more valuable article than honey, it pays the bee-keeper of to-day to produce honey in preference to making the bees expend their energies in the production of wax. With modern methods of

extraction, the honey is removed from the combs and these are again given to the bees, or carefully stored away for use in the next season. The wax which the bee-keeper now obtains, results from the melting up of cappings, old combs, combs which have been in diseased hives, and pieces of drone comb which have been cut out of worker combs, etc. All spare wax should be saved.

There are three main methods of rendering wax, that is, of obtaining the pure wax from the various waste products, such as cappings, comb, etc., namely, by the use of the Solar wax extractor, the unheated wax press and the heated wax press.

The Solar wax extractor, which usually consists of a long, shallow tray covered with glass, can only be used during the warm months as the wax is melted by the heat of the sun, and it is suitable only for new comb and pieces of newly-made wax. Old combs will not melt in the Solar wax extractor and for these one of the other forms of extraction must be employed. The bee-keeper who has a few hives only may not wish to go to the expense of purchasing a hot-water wax press unless it is his intention to increase the number of his colonies, in which case it might be advisable. An excellent hot-water extractor devised by Mr. Sibbald may be purchased for about eight dollars (see Fig. 3). When the amount of wax is small, it may be melted up in water in a tin or copper vessel which is heated by placing it in a large pan of boiling water. Wax should not be melted in an iron vessel or in water containing iron. When the amount of wax justifies the use of more up-to-date methods of extraction, a wax press such as the Sibbald, which may be heated by means of hot water or steam, is recommended.

The resulting wax may either be made up into foundation or sold. In the latter case, it will be necessaryto remelt it to purify it further.

FEEDING.

There are two chief reasons for feeding bees. Sometimes it is desired to stimulate brood raising when the supplies in the hive and outside are short; this may be either in the spring or during a spell of drought previous to a honey flow. The second reason is for the purpose of enabling the bees to make up the requisite stores for their own use during the winter. Although it is often advisable to resort to stimulative feeding in the spring, it cannot be said that feeding in the fall for winter stores after the close of the honey season, unless the latter part of the season has been an exceptionally dry one, is good bee-keeping. It indicates that the bees have been robbed of surplus which should have been left for their own use during the winter. Spring feeding is often necessary but fall feeding can usually be avoided. One of the chief objections to feeding is that it may induce robbing.

Either honey or syrup made from sugar may used for feeding. If honey is used, the bee-keeper must assure himself that there is no disease in the apiary from which it originates, otherwise he will run a very great risk of having disease introduced into the apiary. The safest plan is *never to buy honey for feeding.* When honey is used it should be thinned a little by the addition of warm water. If the bee-keeper has no honey which has been produced in his own apiary, sugar should be bought for feeding in preference to honey. Only the best granulated cane sugar should be used. Cheap grades of sugar and molasses should be avoided, as they usually prove harmful. For spring stimulative feeding, the syrup is made of equal parts by weight or volume of the granulated sugar and water. The mixture should be boiled gently and stirred until all the sugar is dissolved. The greatest care must be taken to avoid burning it as the slightest burning will prove injurious to the bees.

For winter feeding the syrup must be thicker and two parts of sugar should be dissolved in one part of water. The hives should be carefully examined from

about the middle of September to the beginning of October to see what winter stores they have. At this time, a good colony should have from twenty-five to thirty-five pounds of capped honey, depending upon the average length of the winter. This can be roughly estimated from the fact that the standard-sized frames of the Langstroth hive will hold about five pounds of honey when filled. There should be, therefore, about six frames of capped honey. It is a good rule to feed one pound of the winter syrup for every pound of honey if the bees are short of the required amount. For example, if the bees have altogether only three frames of capped honey it will be necessary to feed them with about twelve to fifteen pounds of syrup. A teaspoonful of tartaric acid added to every twenty pounds of sugar will usually prevent the sugar granulating as is often the case when the syrup is concentrated.

There are many kinds of feeders which may be used to give this syrup to the bees. A very simple form may be made by punching a number of small holes in the metal cap of a glass fruit jar. If the jar is then filled with syrup and the cap screwed on tightly it may be inverted over a hole in the quilt on the top of the frames. Another simple method is to half fill a shallow tin pan with syrup and fill it up with shavings or excelsior, or lay a piece of canvas, cheese cloth or sacking previously wetted on top of the syrup. In both these cases, the pan is placed on top of the frames, the roof having been raised by means of a shallow or a deep super, and the bees are able to obtain the syrup without any risk of their being drowned. The majority of bee-keepers have special preferences with regard to the type of feeder they use. A few of the latter may be mentioned. The "Simplicity" feeder is a plain wooden trough divided by wooden partitions. It is placed on the top of the frames. The Miller feeder (Fig. 7) is a form which is placed over the brood chamber. Its chief advantages are that the bees have direct access to it from the brood chamber with which it is in communication, and also that it will contain a large amount of syrup. A favourite type of feeder is the Division-board feeder (Fig. 8) devised by Mr. Doolittle. It consists of an ordinary brood frame which has the middle portion of the top bar removed

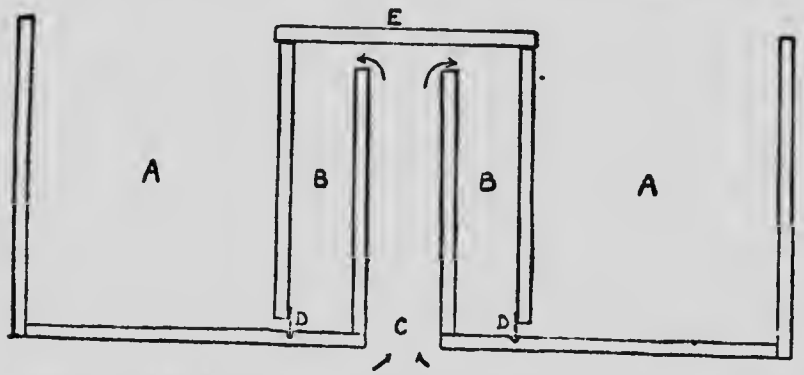


FIG. 7.—Section of the Miller feeder, showing its construction: *A*, *B*, syrup reservoir; *C*, bee entrance to feeder over frames; *D*, strip of perforated zinc or wire; *E*, removable cover.

and wooden sides, thus making a thin box open at the top. It is divided by a wooden partition. A great advantage of this feeder is that it can be inserted into the brood chamber and does not necessitate the addition of a super or other alteration in the hive such as many other types of feeder require. Other forms of feeders are made which are placed under the hive. In some cases, the hives must be raised by means of a shallow addition, in other cases, for example in the Alexander feeder, the trough-like feeder is placed underneath the rear of the hive which is moved back a little to cover it.

In most parts of Canada it is advisable to complete the feeding in the fall by the end of September; in British Columbia it may be postponed for a month, otherwise there might be a tendency for the bees to devote to the raising of brood too much of the honey which should be stored for winter supplies. To a limited extent, brood raising should be encouraged in the fall in order to have plenty of young bees in the hive for the winter, but it must not be overdone, otherwise the bees will deprive themselves of stores.

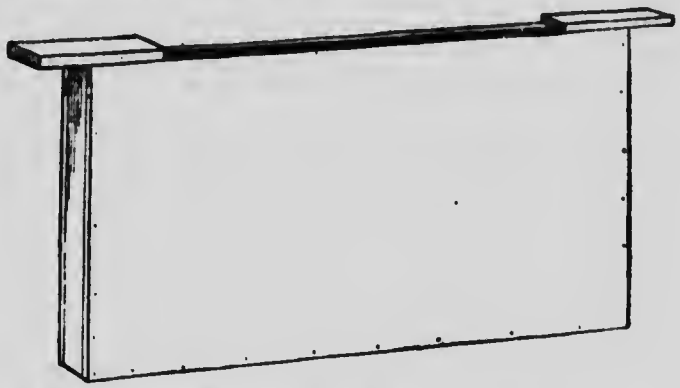


FIG. 8.—Division-board feeder to hang in the hive in place of a frame.

WINTERING.

The care of bees during the winter is a problem of special importance in many parts of Canada wherever prolonged spells of very low temperature are experienced. The climatic conditions of the various provinces necessitate the adoption of different methods of wintering the bees. With the exception of certain parts of British Columbia, such as the dry belt, where the winter is mild, and in southwestern Ontario, it is usually advisable to winter the bees indoors, that is, under cover. If the temperature does not fall below zero (Fahrenheit) they may be wintered generally outside. Below 45 degrees F. they are usually inactive but, as the temperature rises to 50 degrees F., they become active and may start to rear brood. The most satisfactory method of wintering them, therefore, is to maintain the hives at a constant temperature of 45 degrees F.; this can be accomplished by indoor wintering if the winter is mild. Being in a constant state of inactivity during the winter they consume less stores than if they are subject to a variable winter temperature, as is usually the case when they are wintered out of doors.

In order to ensure, so far as is possible, the successful wintering of the bees, the bee-keeper must pay careful attention to the following requirements. The hive should be well filled with young bees. If there is a large proportion of old bees, they will die of old age during the winter with the result that the colony will be weak in the spring. If brood rearing continues up to about the middle or end of October, there will be a good supply of young bees and the hive will come out of the winter quarters in a strong condition in the spring. When the bees are crowded together on the approach of cooler weather at the end of October or the beginning of November, they should occupy not less than six spaces between the brood combs. It is preferable to have seven or eight spaces filled with bees when possible. The bees should go into winter quarters with a good supply of stores; as has already been stated, they should have from twenty-five to thirty-five pounds of capped honey at this time of the year. If the locality is one in which the winters are unusually long, it will be advisable to winter them

on a larger supply of honey. The queen should be a young one, preferably not more than two years old. A young and prolific queen means the production of plenty of young bees and an early start in the spring, upon which the season's success often depends.

OUTDOOR WINTERING.

In those localities in which the winter is mild enough to permit outdoor wintering, some protection will be necessary. If the hives are single-walled, as is usually the case, the best method is to pack the hive in chaff or other substance in a large box. Obtain a packing case or make a case the size of the interior of which is about six inches larger each way than the outside of the hive. At the bottom of this, pack dry leaves, straw, sawdust, wood-shavings or excelsior to a depth of about six inches and stand the hive on top of this layer. An entrance hole must be made in the side of the outside box opposite the entrance of the hive and a piece of wood must be placed inside the box above the entrance to keep the entrances open and in communication. When this has been done, the whole of the space between the hive and the outside case is filled with the packing material. The roof of the hive should be removed and two thin strips of wood may be placed on the top of the frames underneath the quilt to form a bee passage. The top of the hive is now covered with the packing material and the top of the wooden case is nailed or screwed on. The top should be water-tight and, to ensure this, it should be covered with tarred building paper which is folded down on the sides of the outer case and held in position by means of laths along the edges.

A number of forms of double-walled hives have been devised and where these are used, namely, in the mild regions near the coast, no further protection will be necessary beyond the filling of the space between the outer and inner walls with packing material and the placing of a chaff cushion on the top of the hive over the frames. The great danger to guard against in outside wintering, and also when wintering indoors, is dampness. Every precaution must be taken to keep the hive dry, otherwise the colony may be lost. When the weather is cold, the entrances should be contracted but not sufficiently to prevent the passage of the bees.

INDOOR WINTERING.

In most parts of Canada it will be advisable to winter the bees indoors, which has already been shown to be the most satisfactory method if carefully carried out. It may be mentioned, however, that bees have been successfully wintered out of doors in Northern Ontario (near Liskeard) in boxes with a layer of ten inches of sawdust packing. There is no doubt that, with care, bees could be successfully wintered out of doors in many localities where the temperature frequently falls below zero Fahrenheit. Although each bee-keeper must necessarily be guided by the accommodation which he has available, it may act as a guide if a short description is given of the bee-cellar in which the colonies belonging to the apiary of the Division of Entomology are wintered.

The bee cellar is boarded off from the cellar of a private house, which cellar has stone walls and a concrete floor. The chamber measures 11′ 6″ wide, 15′ long and 7′ high. It is boarded off from the cellar of the house by a partition which forms a wall around the whole of the chamber and is separated by an air space from the stone wall. The cement floor is well drained below and dry. In the bee cellar there are three tiers of shelves and two passages. The lowest shelf is 18 inches from the floor, the second shelf is 20 inches above the lower shelf and an equal distance separates the second and third shelves. Neither the uprights supporting the shelves nor the third shelf touches the roof of the

chamber, with the result that no vibrations can reach the hives from above. Sliding ventilators in the wooden walls of the chamber and also in the cellar are arranged to maintain an even temperature. Sudden changes of temperature must be avoided and the ventilation of the chamber must be attended to most carefully. The temperature of the bee cellar should be kept between 40 degrees F. and 45 degrees F. from the time the bees are put in until they are removed in the spring. If the temperature rises the bees will become restless and cold air should be carefully admitted at night by opening the ventilators which may be closed in the morning. In extremely cold weather it may be necessary to raise the temperature of the large cellar by means of a small stove and by adjusting the ventilators the temperature of the bee chamber may be maintained above 40 degrees F. The cellar must be rat and mouse proof.

Experiments carried on for a number of years in the Apiary of the Division have shown that the following is one of the most satisfactory methods of preparing the bees for wintering in the cellar. The hives are placed on the shelves and each hive has a three inch block under the back end so that the rear is higher than the front; this ensures a better ventilated and a drier hive. In addition, each hive is raised from its own bottom board by means of a one-inch block placed at the back. The front entrance is left wide open. The roof or cover of the hive is removed, and its place is taken by a chaff cushion four inches thick and large enough to extend two or three inches over the sides of the hive; several layers of coarse sacking or two or three empty bags may be used if preferred. If there are no shelves in the bee cellar, an empty hive should be placed on the floor and a three-inch block should be placed on the top of the hive at the back. Upon this, three hives may be tiered, each being blocked up in the manner already described in the case of hives placed on shelves.

Bee cellars are sometimes built into the side of a small hill and satisfactory results have been obtained from such methods of wintering.

It is not possible to give a definite time at which the bees may be placed in the cellar, especially in view of different climatic conditions and the variability of the seasons. They should be removed from their summer stands on the approach of severe weather and when the raising of brood is finished. From records extending over a number of years, it has been found that from southern Saskatchewan eastward to Nova Scotia, the hives have been usually removed from their summer stands and put into winter quarters during the latter half of November. In the spring the usual time for their removal from the cellar has been during the early part of April. The time varies, however, with the mild or severe character of the season. They should be removed into the winter quarters when the bees are all in the hive, which may be either at night or on a cold day. Very great care must be taken in bringing the hives out of winter quarters; if it is done too early the results may be serious. During the winter, no manipulation of the bees should take place.

SPRING TREATMENT.

Spring is the most critical period of the whole year for the bees. Not only the success of the approaching season but often the existence of the colony depends upon the conditions of the bees in the spring as compared at the close of the wintering period. The condition of a colony at this time of the year is dependent upon its state when it went into winter quarters; in other words, the preparation of a colony for a season's work begins at the close of the preceding season and before the bees are wintered. The essentials for successful wintering were considered in the previous section and upon the attention which is paid to the securing of these conditions will depend the state and strength of the colony in the spring.

If the hives went into winter quarters with a large proportion of old bees and brood raising was discontinued early in the fall, the colony will be very reduced in numbers and in the spring the old bees will rapidly die off. This condition is known as "spring dwindling" and can be prevented by having a large proportion of young bees at the beginning of the winter. The stores may become almost exhausted by spring. Hives may be examined early in the spring by carefully lifting up a corner of the quilt or by tilting the hive in such a manner as not to disturb the bees or interfere with the warmth of the hive. They should have sufficient honey to fill two combs and, if they appear to have a smaller amount, stimulative feeding (see Feeding) should be adopted. The bees should be fed at night, as day feeding may induce robbing at this time of the year when food is scarce.

When bees begin to fly in the spring, they gather large quantities of pollen for the purpose of brood rearing, the first pollen being obtained from the various members of the willow tribe, wild crocuses, etc. Activity in this direction is an excellent sign and if the colonies are stimulated by feeding with a little sugar syrup they will be encouraged to devote their energies to brood rearing. A fertile young queen is an important factor in successful spring management. Sometimes, when the old queen is not replaced at the end of the season, the colony becomes queenless during the winter and this state is indicated by the restlessness and buzzi of the bees and the absence of brood. If the colony is weak in the spring i ould be united to a stronger colony; if it is fairly strong it may be given one or two frames containing young brood from the strong colony. From this brood, the queenless bees are able to raise a queen. When the bees are actively flying, an examination of the colony may be made with a view to finding out the state of the colony as regards brood rearing; if it is found that the brood is scattered over several frames, they should be moved to the centre of the hive. When an unusual flow of honey occurs early in the season, the combs are frequently filled up with honey and the queen is deprived of laying facilities; to remedy this, when such conditions occur, a frame of empty worker comb should be placed near the centre of the colony. If the queen is a young one of the previous year, one of the wings may be clipped at this time of the year, as previously recommended.

ROBBING.

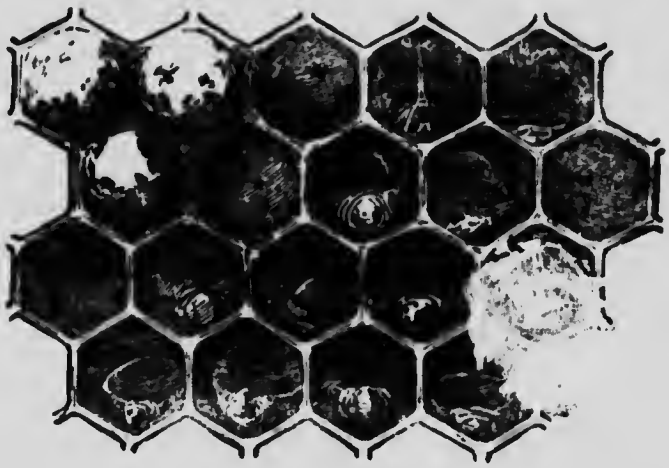
Although the bee is a model of industry, it is not free from the tendency to obtain its means of existence in the easiest way and to steal the stores of weaker communities. Robbing is usually started by a scarcity of nectar in the field; therefore, if the bees are strong and there is a lull in the honey flow, the bee-keeper himself may be responsible for starting the evil, by leaving honey or syrup exposed in the apiary. Immediately the bees discover that there is an easier way of obtaining honey than by scouting the countryside for nectar, they will readily change their habits. Carelessness, therefore, in opening hives, in leaving honey and syrup exposed in the apiary or in the bee house, will often serve as an incentive and woe betide a weak colony when robbing begins. The weak colonies do not usually offer much resistance, but the robbers become more bold and then fierce are the encounters; in extreme cases the whole apiary is sometimes thoroughly disorganized. When robbing has begun, the entrances of the hives should be contracted to enable the occupants to defend them more easily; the hives should not be manipulated, except when it is absolutely necessary, in which case it should be carried o only in the early morning or late in the day when few bees are flying. It is occasionally necessary to handle the hives under small tents of mosquito netting. When it is found that a hive

is being robbed, a bunch of damp grass, hay or brush may be thrown in front of the entrance; this will frequently serve to prevent the robbers entering the hive.

Robbing most frequently takes place in the spring and fall when honey is scarce, and its prevention is an additional reason for having the colonies strong at those seasons of the year.

BEE DISEASES AND THEIR TREATMENT.

The diseases to which bees are subject may be divided into two classes, namely, diseases affecting the adult bees and diseases affecting the brood. Of all the diseases, the two affecting the brood, which are known as American Foul Brood and European Foul Brood respectively, are the most serious and together constitute the greatest menace to apiculture wherever they are found to occur. One may compare them to cholera or small-pox among human beings. In a recent bulletin issued by the United States Department of Agriculture, it is stated that the loss to the bee-keepers of that country, owing to the actual death of the colonies by diseases, is estimated conservatively at $1,000,000



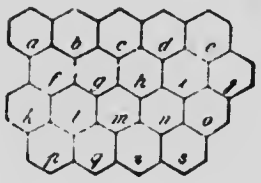


FIG. 9.—American foul brood: *a*, *b*, *f*, normal sealed cells; *c*, sunken cappings, showing perforations; *g*, sunken cappings not perforated; *h*, *l*, *m*, *n*, *q*, *r*, larvae affected by disease; *e*, *i*, *p*, scales formed from dried down larvae; *s*, pupae affected by disease. Three times natural size. (Phillips, *Farmers' Bull. No. 442. U.S. Dept. Agric.*)

annually. This does not take into account the loss of the crops entailed by the destruction of the bees nor the severe setback which is given to the industry in the localities where the diseases occur, resulting frequently in the total abandonment of bee-keeping. These diseases are spreading in Canada and are particularly serious in the Provinces of Ontario and Quebec. As in other countries and states where bee-keeping is encouraged, these provinces, and also British Columbia, have passed legislation dealing with the control of these brood diseases and the reader is referred to the succeeding section where these laws are given in full. In this connection, however, it should be pointed out that in these diseases, as in human diseases, vigilance and prevention should

be the watchwords. If the diseases break out they will rapidly spread through and endanger the whole district in which they occur. Bee-keepers should co-operate in eradicating them in their districts and should bring to bear all their powers of persuasion upon the indifferent or careless apiarist. If this fails, they should notify the Department of Agriculture of the Province, or the Division of Entomology of the Dominion Department of Agriculture, Ottawa. When disease occurs in any locality, constant vigilance and action are necessary to keep the apiary in a state of freedom from it.

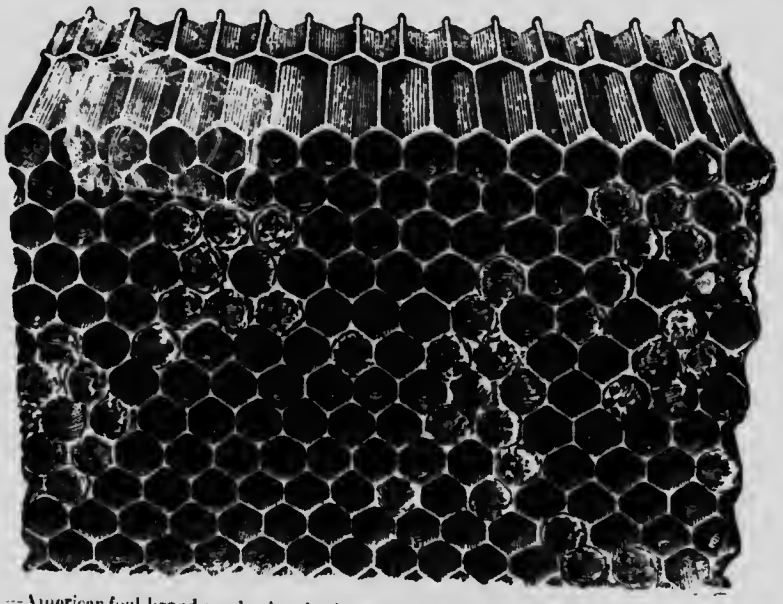


FIG. 10.—American foul brood comb, showing irregular cappings and scales. The position of the comb indicates the best way to view the scales.

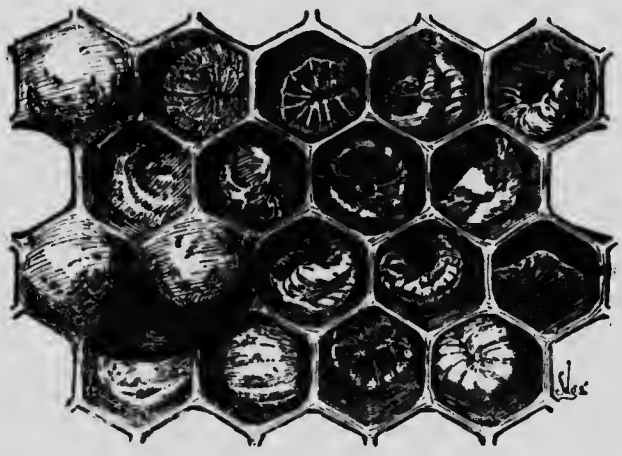
(*Phillips, Farmers' Bull. No. 442. U.S.Dept. Agric.*)

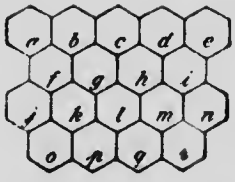
So far as can be discovered, American Foul Brood and European Foul Brood do not attack the adult bees, but by killing off the brood they reduce the colonies to so great an extent that they gradually dwindle away, owing to the absence of young bees to take the places of the old ones. The two diseases are distinct and can be readily separated by appearance and by bacteriological examination. The different appearance of the affected and dead brood in the case of the two diseases, together with other symptoms, affords the bee-keeper a means of identification; in case of doubt, he should consult the local inspector of apiaries or forward specimens of the diseased comb for examination. Both types of foul brood appear to be caused by bacterial organisms although there still remains a little confusion among European and American authorities as to the identity of the organisms responsible for the respective diseases. Dr. White, of the Bureau of Entomology, United States Department of Agriculture, has made, and is still carrying on, a very thorough investigation of the bacteriology of them. He has shown that the micro-organism constantly present in diseased and dead larvæ attacked by American Foul Brood is *Bacillus larvæ* which is probably the etiological factor in this disease. In European Foul Brood, *Bacillus alvei* was constantly found to be present in diseased samples. This organism was first discovered and studied in England in 1885. Further study is necessary before any definite statement can be made as to the cause of the latter disease.

AMERICAN FOUL BROOD.

At present this is the more common and widely spread of the two diseases and is often referred to as simply "Foul Brood". The larvæ are attacked usually when they are full-grown and fill the cell. At first, a brownish discolouration may be observed and the larva sinks down into the cell, gradually becoming darker in colour. At this stage a characteristic typical of the disease may be observed by the bee-keeper. If a small wooden match, stick or wooden tooth-pick be inserted into one of these brownish and diseased larvæ and gently withdrawn, the contents of the larva will string out in a ropy manner. This "ropiness" will often serve as a means of first detecting the disease. Later the larva gradually dries up, forming a brown scale on the lower side of the cell to which it adheres. If the diseased comb is held in a slanting manner so that a bright light falls upon the lower sides of the cells, the scale-like remains of the dried up larvæ can be seen. Most of the larvæ appear to succumb to the disease after the cell has been capped. If the caps are not removed by the disease, they become sunken and in other cases they are merely perforated. The presence therefore of sunken and perforated cappings serves as a further means of diagnosing the trouble. When the pupæ die of the disease, it is not unusual to find their tongues attached to the upper side of the cell. Diseased combs have a characteristic odour generally described as a "glue-pot" odour.

EUROPEAN FOUL BROOD.





. 11.—European foul brood: *a, j, k,* normal sealed cells; *b, c, d, e, g, i, , m, p, q,* larvæ attacked by disease; *r,* normal larvæ at age attacked y disease; *f, h, n, o,* dried down larvæ or scales. Three times natural ize.

Phillips, Farmers' Bull. No. 448. U.S. Dept. Agric.)

This disease has been known in North America under several names, such as Black Brood and New York Bee Disease, etc. While it is not as yet so widely found as American Foul Brood, it is more rapid in its spread and in its destruction and in certain regions has caused enormous losses. It is most important, therefore, that bee-keepers should take every means possible to eradicate the disease wherever it occurs, both for their own sakes and to protect

other bee-keepers in their district. The larvæ are, usually, attacked at an earlier stage than is the case in American Foul Brood; in fact, the majority, while they are still curled up in the bottom of the cell. The disease is also usually more destructive in spring and the early summer than later in the year. A few of the larvæ die after the cells have been capped and, on this account, sunken and perforated cappings may be found. Diseased larvæ first show an uneasy movement in the cell and a slight yellowish discolouration. The larva assumes a very characteristic, slightly translucent appearance, with the result that the silvery trachcæ or breathing tubes can be seen through the skin, giving the larvæ a segmented appearance. The larva usually becomes flattened against the base of the cell, having by this time completely lost its well-rounded appearance; in some cases it falls away from the base of the cell. The colour becomes a distinct yellow, which is characteristic of the disease, or it may be grayish. Finally, it forms a dirty-brown scale at the base of the cell or a shapeless mass on its lower side. When a small piece of wood is inserted into the diseased larva very little "ropiness" is shown. A sickly odour is usually present which to many people is very offensive. Italian bees appear to be able to resist the attack of the disease which is most destructive to Black colonies.

PREVENTIVE MEASURES.

In order to prevent the disease entering the apiary or spreading, should it have entered already, a knowledge of the means by which it is spread is necessary. The chief medium in which the disease germs are carried is honey. This being the case, the different methods of infection will be realized.

Feeding.—Bees should never be fed with honey obtained from outside sources, unless the bee-keeper knows the apiary from which it is obtained and is certain that it is free from Foul Brood. They should certainly never be fed with honey bought in the open market.

Robbing.—A diseased colony in a neighbouring apiary may be weak and in consequence will be robbed with the result that infected honey will be introduced into healthy hives. This should be prevented so far as is possible. Bees will frequently [illegible] the premises of bakers and confectioners who may be using, and often do [illegible]eap honey obtained from localities where disease occurs. This is a cons[illegible]rce of danger. When a diseased hive is being treated or manipulated, it [illegible]e robbed by bees from a healthy hive.

Supplies and Queens.—Unless the bee-keeper is certain that second-hand supplies which he may purchase come from healthy apiaries, there is a danger of infection. Workers which accompany queens when the latter have been purchased for introduction are liable to be infected and unless it is known that the apiary from which they come is free from disease, the workers should be destroyed and the queen transferred to a clean cage.

REMEDIAL TREATMENT.

It is known that the cause of American Foul Brood is the bacterial organism *Bacillus larvæ*, and European Foul Brood will no doubt be shown to be due to a like, namely, bacterial cause. The treatment, therefore, may be directed towards the elimination of the cause of the disease and source of infection. Some recommend and insist upon the total destruction of the bees and hive, etc., by burning and while, no doubt, in the case of bacterial disease such extreme measures are certain in their effect, it has been shown that by careful treatment and subsequent observation the disease can be controlled. This treatment consists in the

FIG. 3.—Sibbald hot-water Wax Extractor.

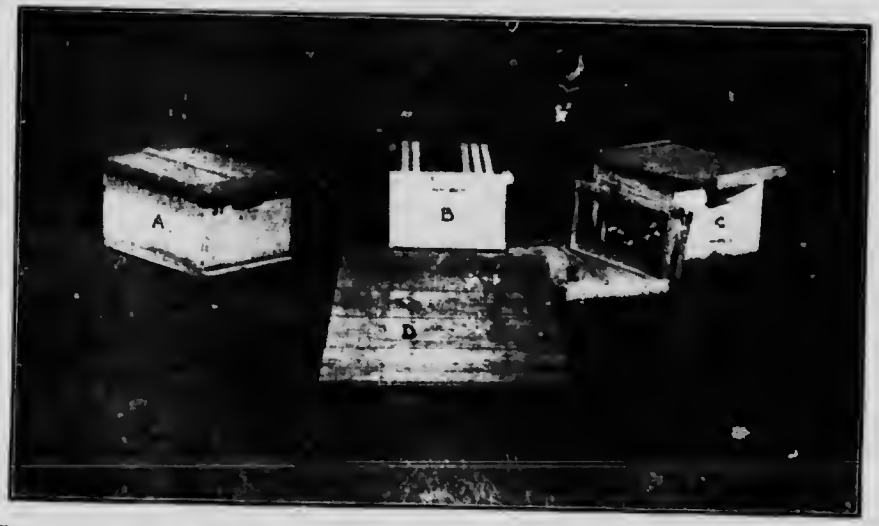


FIG. 4.—Requirements for shaking treatment of Foul Brood: *A*, Hive containing diseased colony; *B*, clean hive on original stand; *C*, empty hive to contain frames after shaking; *D*, board forming runway; *E*, cover of clean hive; *F*, new frames showing starters of wax-foundation; *G*, queen and drone trap; *S*, smoker.

removal of the bees from the infected hive, combs and brood, into a clean hive where they are compelled to use up any honey they may be carrying in the production of wax, thus removing all means of infection if the proper care is taken in manipulating.

The Shaking Treatment.—The method of procedure in this treatment is as follows: The bees should be treated, if possible, when a honey flow is on. If many colonies are to be treated, the operation should begin in the middle of a fine day. If there are only a few colonies they may be treated preferably, in the evening, as the opportunities for robbing are thereby decreased. Everything which will be necessary during the operations should be ready before beginning. A clean hive will be required, fitted with frames having starters of foundation not more than one inch wide, a hive body with cover to contain the diseased combs, an extra hive cover or flat square board, a queen and drone trap, lighted smoker and hive tool.

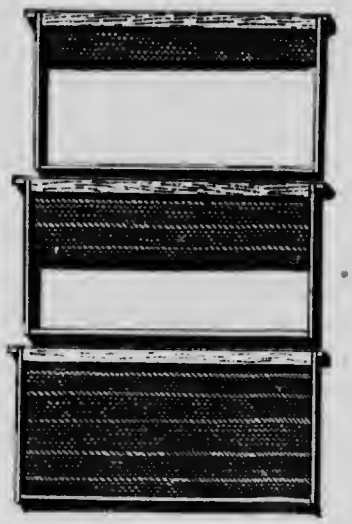


FIG. 12.—Three frames containing: starter, half sheet and full sheet of wax foundation respectively.

All is now ready (Plate II, Fig. 4). Remove the hive containing the colony from its stand to one side and place the clean hive on the original stand with the flat board or hive cover resting on the alighting board and forming a run-way. One or two of the frames should be removed and the others, if they are not self-spacing frames, should be pushed to one side to provide a space in the centre of the new hive and to prevent the bees running over the sides of the hive body. The frames are now removed one at a time from the old hive and each frame is lowered partially into the space in the middle of the new hive into which, by a sharp downward jerk, the bees are shaken. If it is found that this method is shaking new honey into the hive, which honey in all probability will be infected, the bees must either be brushed into the hive instead of being shaken or, as is preferable, newspapers may be spread over the run-way in front of the hive and the bees then shaken on to the paper in such a manner as to enable them to run up to the hive. These papers can afterwards be burnt and the infected honey will then be destroyed instead of being shaken into the clean hive and thereby transmitting the infection in spite of all the precautions taken. When the bees have been transferred, the frames may be correctly spaced and the cover put on. It is advisable to cover the entrance of the hive with the queen and drone trap as this will prevent the colony leaving, otherwise such a desertion may take place.

A second shake into a hive containing frames provided with full sheets of foundation is frequently recommended but experience has shown that this is not necessary. Sometimes the disease will reappear in a hive, in which case the shaking treatment should be repeated.

The bee-keeper will naturally desire to save what he can from the infected hives after treatment. The saving of the healthy brood is attended by some risk, owing to the fact that the combs still contain infection and it is not to be recommended. Infected honey, that is the honey from the diseased combs, may be extracted and is perfectly suitable for human consumption, but the greatest care must be exercised lest any bees should have access to it. After extraction the combs should be carefully protected from bees, pending the rendering of the wax. Combs of wax from infected hives may be melted down and the wax may be safely used for comb foundation. Infected combs and wax should not be put into the Solar wax extractor.

The hives which have contained diseased colonies must be cleaned and scraped and afterwards thoroughly disinfected by burning in the following manner: The hive bodies are tiered one above the other to form a chimney down the inside of which kerosene or gasoline is poured. Some straw or excelsior is now lighted at the bottom of the chimney so formed and after it has been allowed to burn for a few seconds a hive cover is put on the top to extinguish the flames. Infected frames should be burnt, but division boards, and such other equipment used in the hive as queen excluders, etc. may be disinfected by boiling in water for half an hour to an hour.

Treatment by means of the bee-escape.—Many bee-keepers prefer this method of treatment as it involves less disturbance in the apiary. The method of procedure is simple. The diseased hive is removed from its stand and is replaced by a clean hive with new frames and foundation. The queen of the diseased colony must be found and placed in the clean hive. The diseased hive is now placed beside the new hive to which the bees out in the field fly on their return, or it may be placed above the new hive but separated from it, and a bee escape placed over the entrance of the diseased hive which allows the bees to leave the hive but not to return and they will enter the new hive in which the queen is to be found. When all the bees have left the old hive, the honey and wax may be extracted in the usual manner.

Other methods of treating these diseases have been recommended and in some cases have apparently been successful. A treatment for European Foul Brood known as the Alexander treatment, consists in the removal of the queen and the maintenance of the colony in a queenless state for a certain period. The treatment of European Foul Brood by means of feeding the colonies with syrup containing chemicals is practised in Europe, but to what extent any resulting cure is due to the action of the chemicals or to other causes is a matter of conjecture: such treatment is useless in the case of American Foul Brood and cannot be recommended.

An important step in preventing and combating European Foul Brood is the re-queening of the colonies with healthy young Italian queens. Italian bees appear to be able to resist the disease more strongly than other races.

DYSENTERY.

On opening the hive in the spring, the presence of this disease is often indicated by the fact that the hive and combs are spotted with brownish-yellow excrement. Sometimes it may result in the loss of the colony. It is an intestinal disease of the adult bees and a distended condition of the abdomen is caused by the accumulation of fæcal matter. The disease occurs only in the winter and appears to be due to the bees having consumed honey of a poor

quality and to their close confinement during the winter. Where bees have collected honey-dew, it invariably causes dysentery and syrup made from sugar of poor quality will often be responsible for its appearance. When the bees are able to leave the hive and to have a cleansing flight, the disease will frequently disappear. As a preventive measure, the bees should always be fed on honey or sugar syrup of the best grade when fall feeding is necessary.

PICKLE BROOD.

The term "pickle brood" no doubt includes several diseases having somewhat the same appearance. Brood may also have been killed by chilling. The chief drawback about this brood disease is that it may be mistaken for one of the infectious and serious brood diseases previously mentioned. It appears to be neither infectious nor serious in its effects. The diseased larvæ may be distinguished from larvæ which have been killed by American or European Foul Brood. The body is usually swollen and the contents do not show any "ropiness"; on the other hand, they are usually watery in nature; the colour varies from yellow to brown.

ENEMIES.

In addition to the aforementioned diseases the bees have numerous other enemies of which the following are the chief.

THE WAX MOTHS.

There are two species of these insects which are also known, among other popular names, as "bee moths" and "wax worms". They are the Larger Wax Moth (*Galleria mellonella* L.) and the Lesser Wax Moth (*Achroia grisella* Fab.) and the larvæ or caterpillars of both species are the destructive stages of the insects' life-histories, as they eat through and destroy the combs. The name, strictly speaking, is somewhat of a misnomer, as the caterpillars do not appear to feed on pure wax but on the combs which contain pollen, the cast-off tissues of the developing brood and other debris, and they burrow long tunnels through the wax which are lined with a strong protective web of silk.

It should be pointed out that all evidence points to the fact that damage is inflicted only to those colonies which are weak, either on account of queenlessness, lack of stores or neglect. Strong colonies do not suffer and even though the pest obtains entrance, the caterpillars are quickly removed, especially if the stock is Italian. In weak colonies and in stored combs, however, they may cause very great damage.

The Larger Wax Moth is the more common and destructive. Its life-history, briefly, is as follows: There are usually two broods during the season. The first brood appears in May and the second brood in August. The moth measures about three-quarters of an inch in length; it is most commonly of a dull grey colour. When they are at rest on a weathered board or the side of the hive, it is sometimes difficult to detect them. They either deposit their eggs inside the hive, entering at dusk, or in the crevices of the hive. The larvæ begin to tunnel their way through the combs soon after hatching. The caterpillar of the Lesser Wax Moth often feeds on the debris in the bottom of the hive. When full-grown, the caterpillar is of a dirty-white or grey colour and measures about an inch in length. It spins a silken cocoon in which it changes into a chrysalis from which the moth emerges. The winter is usually passed in the chrysalis stage.

The most important means of controlling these two pests is to keep the colonies strong. The caterpillars will make little headway in a strong colony. If a colony is weak, some method should be adopted of making it strong, either by giving it more brood or by uniting it to another colony. When the caterpillars are seen they should be cut out with a knife. Stored combs are often seriously damaged by them. When the insect is found attacking such combs, the latter should be put into a box or chamber which can be closed tightly and fumigated with carbon bisulphide or sulphur. Care must be taken in the use of carbon bisulphide as the vapour is extremely inflammable. Combs should be stored in dry, well-ventilated rooms. Experiments carried out some years ago in the apiary of the Division showed that, in localities where a zero temperature is experienced, the moths can be controlled by storing the combs during the winter in dry situations where they may be exposed to the effects of a low temperature. Bee-keepers should be warned against moth traps and falsely called moth-proof hives.

MICE.

Care should be taken to prevent mice obtaining access to stored combs or great damage may be inflicted. Not only the honey house but the bee cellar also should be mouse-proof as mice sometimes cause serious trouble to colonies when they are wintering.

BEES IN RELATION TO FLOWERS AND FRUIT.

For what purpose do flowers assume such varied and beautiful colourings? Why are certain species strongly scented? The thoughtful person is no doubt sometimes puzzled by these questions. The person who does not think probably assumes that they have been provided for his special delectation. While flowers, on account of their wealth of colour, form and perfume, are certainly a great source of pleasure from youth to old age, it is a mistake to assume that such is the sole purpose of such beauty and variety. The purpose of a plant is the same as the purpose of an animal, namely, the perpetuation of the species and race and to that end the whole of the plant is adapted.

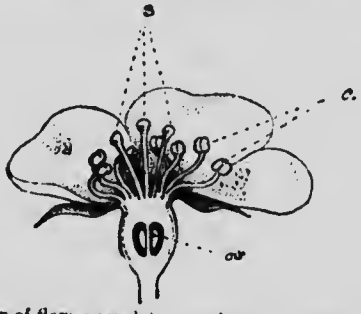


FIG. 13.—Section of flower (apple): *a*, anthers; *ov*, ovules; *s*, stigma.

The usual mode of propagation in the case of flowering plants is by seeds. Seeds are the result of the fertilization of the female cells of the plant by the male cells. The former are called ovules and are generally borne in one or more seed chambers bearing a sticky organ known as the stigma. The male cells are the pollen grains which are developed in the anthers borne on the stamens. Before the seed can develop, therefore, the ovule must be fertilized by the male cell and this is brought about by the transference of the pollen (the male cells) from the anthers to the female organ, the stigma. The majority of plants have flowers bearing both male and female organs, although some plants bear flowers of one sex only.

In view of these facts, which are necessarily very briefly stated, it will be seen that, in the case of the majority of flowering plants, the perpetuation of the species is dependent upon the transference of the pollen to the stigma. It is to this end that plants have developed their great variety of colour, form and perfume. It may be asked in what way does all this assist in the propagation of the species. Except in certain species, the flowers cannot fertilize themselves even though both male and female organs exist in the same flower. They have to call in the help of some agent. That agent is most commonly an insect and, of all the insects, the bees are the chief factors in the pollination of flowers. But bees will not visit flowers merely for the pleasure of doing so. They must be attracted and consequently they are enticed by the sweet nectar which the flowers secrete in special organs. With this knowledge, how much more interesting are all these things. The flowers flaunt their medley of colours to summon the bees to hidden feasts of nectar; for the colour is developed to make the flower attractive. The attractive colouration of flowers requiring the assistance of bees in cross-pollination may be compared to the coloured berries which attract the birds upon whose services such plants are largely dependent for the distribution of their seeds. In entering or leaving the flower, the hairy body of the bee is brushed by the anthers and powdered with the contained pollen which it carries to the female stigma of another flower, thereby ensuring cross-fertilization which increases the production of seed and the vigour of the resulting plants. All this service the bee performs in return for the nectar and surplus pollen which it carries away to store. Space will not permit a consideration of the numerous and bewildering devices which flowers adopt to attract the bees, to prevent their obtaining the nectar without performing their duty of cross-pollination in return, to guide them to the nectaries and to accommodate them while they are partaking of the feast, all of which forms one of the most fascinating of studies.

FIG. 14.—Diagrammatic section of flower to show how pollen is transferred to the bee and from the hairs of the bee to the stigma of another flower: *a*, anthers; *n*, nectary; *s*, stigma.

Briefly though they be given, the foregoing facts indicate the important and wide relationship which exists between flowers and bees. When the flowers belong to cultivated plants, whether the plant be alsike clover or apple, the necessity of having as many flowers fertilized as possible is apparent. Experiments have shown that in the case of fruit trees, three to four times as much fruit sets when bees have access to the flowers, and in the case of alsike and white clover, when the bees are prevented from visiting the flowers, no seed is produced. It should be unnecessary to insist further upon the value of bees in the production of flowers, seed and fruit.

Some flowers produce more nectar than others and the different qualities of honey resulting from different species of plants has already been mentioned. Further, certain plants produce more pollen than others. From the point of view of the bee, the profuse production of pollen by such early-flowering plants

as the willows, is a distinct advantage, as pollen is necessary for the rearing of brood.

LIST OF HONEY AND POLLEN PLANTS.

For a number of years, observations have been made upon the honey and pollen producing plants and the times of the year at which they flower. The following is a short list of such plants giving the months in which they flower; the variability of the seasons and the climatic conditions renders the exact date of flowering of little real value. This calendar may be of value to the beginner in indicating when he may expect the different honey flows, though he will soon learn the incidence of such periods. The more important honey producing flowers are indicated in capitals.

Manitoba Maple and Soft Maple	April.
Willows (pollen producing)	April to May.
In British Columbia	February and April.
Dandelions	April to May.
GOOSEBERRY, CURRANT	May.
APPLE, PLUM, CHERRY, PEACH AND PEAR	May.
British Columbia	April and May.
Siberia Pea Tree (*Caragana*)	May.
Lilac, Honeysuckle and Barberry	May.
Juneberry or Service Berry (*Amelanchier canadensis*)	May.
Grape Vine	May and June.
Strawberries	June.
RASPBERRY, BLACKBERRY	June.
Wild Mustard	June.
WHITE CLOVER (*Trifolium repens*)	June and July.
ALSIKE CLOVER (*Trifolium hybridum*)	June and July.
ALFALFA	June and July
BASSWOOD (*Tilia americana*)	July.
SWEET CLOVER or MELILOT (*Melilotus albus*)	July and August.
Willow Herb	July and August.
BUCKWHEAT	August and September.
GOLDEN ROD (*Solidago*)	August-October.
Wild Asters (*Aster*)	August-October.

The question is sometimes asked whether anything can be gained by planting nectar-producing flowers for the bees. Owing to the fact that bees forage over a wide area, it is impracticable to sow special crops for the bees, especially as there usually exists plenty of natural forage. Frequently, however, waste pieces of land may be advantageously sown with white clover and in those regions where crocuses can be grown in the gardens or near to the apiary, they provide an appreciable amount of pollen in the spring when such food is of value.

BEES AND FRUIT.

In addition to the beneficial relation of bees to fruit trees in the production of a heavy set of fruit, there are two problems upon which bee-keepers and fruit growers are in danger of entertaining conflicting opinions and as they are important, some reference should be made to them.

Bee keepers occasionally suffer losses in the spring by the poisoning of their bees after they have visited fruit trees which have been sprayed while in bloom. Not infrequently the bee-keeper is at first unable to discover the cause

of the dying off of the brood and workers; disease is suspected but no symptoms can be discovered and finally the true cause of the death of the bees is apparent. They have been foraging on fruit blossoms which have been sprayed with an arsenical spray. In these cases, the action of the fruit grower is culpable and in certain of the United States, legislation has been passed forbidding the spraying of the fruit trees while they are in bloom. The fruit grower, however, should not require such legislation as the experimental work which has been carried out has shown that the spraying of the trees while they are in bloom is injurious to the blossoms and to spray at such a time is therefore contrary not only to the interests of the bee-keeper but also to his own. For the Codling Moth, on which account this application of the arsenical spray is made, the arsenic l should be applied *after* the petals have fallen and within a week of their alling.

Fruit growers have complained of the supposed injury to ripe fruit by bees. A few years ago, a series of experiments were carried out in our apiary to discover to what extent bees would injure ripe fruit. It was found, and similar results have been obtained by other investigators, that bees will not injure sound fruit and that they will feed only upon fruit which has already been damaged or injured by some other means. This is an experiment which any fruit grower can confirm for himself. Bees, therefore, cannot be accused of causing injuries to sound fruit.

HONEY DEW.

Towards the end of the summer, the leaves of trees are often covered with a sugary substance and the vegetation found beneath such trees is sometimes similarly covered. The supposed heavenly origin of this substance gave it the name it still retains. We now know that it is formed in a much more simple manner, and is really excreted from the digestive tracts of plant lice (*Aphides*) and scale insects (*Coccidae*). The saccharine substance is ejected from the anus of the insect and not from the pair of small horns or cornicles near the end of its body as was originally, and is still in many quarters, supposed to be the case. Honey dew is a waste product of the plant lice. These insects feed by sucking the juices of the plants and in so doing they are compelled to take a large amount of liquid, all of which cannot be assimilated in digestion; accordingly the surplus is excreted in the form of a sugary solution. It attracts ants, bees and wasps, and, in some years, bees may gather large quantities of it. The honey resulting from the conversion of honey dew is usually of a poor quality and is generally unsaleable. It may be used for stimulative feeding in the spring, but should not constitute a portion of the winter stores of bees when wintered indoors. Bees that are confined and fed upon such honey will usually develop dysentery and the colony may be lost as a result. Should bees, which are wintered indoors, have collected honey dew, it would be advisable to extract such honey and replace it by feeding on honey or syrup.

GENERAL INFORMATION.

This bulletin is little more than a guide to beginners and the bee-keeper may soon find that he requires more detailed information on questions but briefly considered here and on other matters, the treatment of which space forbids. He will accordingly wish to know of some book in which apiculture is fully treated. No bee-keeper should be without a treatise of some kind on the subject as the knowledge thus gained can usually be put to most profitable use. The following books, each of which is a standard work on the subject, may be consulted.

The Bee-keepers' Guide or Manual of the Apiary, by A. I. Cook.

Langstroth on the Honey-bee, Revised edition by Dadant & Son.
Advanced Bee Culture: Its Methods and Management, by W. Z. Hutchison.
The A. B. C. & X. Y. Z. of Bee Culture, 1910, by A. I. & E. R. Root. Every bee-keeper should have this encyclopedia of bee-keeping, of which an edition in French is also published.
How to Keep Bees: A Hand-book for the use of Beginners, 1905, by Anna B. Comstock, is a delightfully written manual for the beginner.

All these books may be obtained through a bookseller. *The A .B. C. & X. Y. Z. of Bee Culture* may be obtained directly by from the A. I. & E. R. Root Company, Medina Ohio, U.S.A.

The following journals are devoted exclusively to bee-keeping:
The Canadian Bee Journal, published monthly at Brantford, Ont.
The American Bee Journal, published weekly at Chicago, Ill.
Gleanings in Bee Culture, published fortnightly at Medina, Ohio, U.S.A.

When disease is suspected, the nearest apiary inspector should be called in or a sample of the diseased brood comb about five or six inches square containing diseased larvæ may be sent to the Division of Entomology for examination and report. This sample should not contain honey and should be packed in a strong wooden or tin box. Such samples and letters may be mailed "Free" when addressed to the Dominion Entomologist. The letter should be sent separately and the beekeeper's name should be given on the outside of the package.

LEGISLATION AGAINST BEE DISEASES IN CANADA.

It has been recognized that in order to combat the bee diseases, European and American Foul Brood, with any hope of ultimate success, legislation was necessary. It was not until legislation was passed that any advance could be made in preventing the spread of, and in eradicating, diseases of live stock and the same is equally applicable to bees. In most of the countries and states where bee-keeping receives the attention which it merits, legislation has been enacted to prevent the introduction and spread of brood diseases and to enable the authorities to take the necessary measures to treat infested colonies, etc. In practically every case, inspectors are appointed to carry out the provisions of the Act.

Ontario was the first province of Canada to legislate in this matter and in 1897 the Provincial Government passed "An Act for the Suppression of Foul Brood among Bees". This was repealed in 1906 by an improved Act of the same title. In April, 1908, the Government of the Province of Quebec passed "An Act for the Prevention and Treatment of Contagious Diseases in Bees" and in March 1911, the Government of the Province of British Columbia passed "An Act for the Suppression of Foul Brood among Bees". In each case, inspectors have been appointed to carry out the provisions of these Acts.

The Ontario Department of Agriculture has appointed sixteen Inspectors who are located in different parts of the Province.

The Department of Agriculture of the Province of Quebec has five Chief Inspectors and five Assistant Inspectors.

The Department of Agriculture of British Columbia is making a survey of the disease situation in the Province and two Inspectors are at present employed; at the time of writing, the Province seems to be comparatively free from disease and on this account, the quarantine regulation in the Act (see below) is of particular value.

The following is the existing legislation in regard to bee diseases in Canada. The Federal Government has at present no legislation.

ONTARIO.

An Act for the Suppression of Foul Brood Among Bees

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

1. This Act may be known as "The Foul Brood Act."

2. The Lieutenant-Governor in Council, upon the recommendation of the Minister of Agriculture, may from time to time appoint one or more Inspectors of Apiaries to enforce this Act and the Inspector shall, if so required, produce the certificate of his appointment on entering upon any premises in the discharge of his duties. And the Minister shall direct and control each Inspector in the carrying out of the provisions of this Act. The remuneration to be paid to any Inspector under this Act shall be determined by order of the Lieutenant-Governor in Council.

3. The Inspector shall, whenever so directed by the Minister of Agriculture, visit without unnecessary delay any locality in the Province of Ontario and there examine any apiary or apiaries to which the said Minister may direct him, and ascertain whether or not the disease known as "foul brood" exist. in such apiary or apiaries, and wherever the said Inspector is satisfied of the existence of foul brood in its virulent and malignant type, it shall be the duty of the Inspector to order all colonies so affected, together with the hives occupied by them, and the contents of such hives, and all tainted appurtenances that cannot be disinfected, to be immediately destroyed by fire under the personal direction and superintendence of the said inspector; but where the inspector, who shall be the sole judge thereof, is satisfied that the disease exists, but only in milder types and in its incipient stages, and is being or may be treated successfully, and the inspector has reason to believe that it may be entirely cured ,then the inspector may, in his discretion, omit to destroy or order the destruction of the colonies and hives in which the disease exists.

4. The inspector shall have full power in his discretion, to order the owner or possessor of any bees dwelling in box or immovable frame hives, to transfer them to movable frame hives within a specified time, and in default the inspector may destroy, or order the destruction of such hives and the bees dwelling therein.

5. Any owner or possessor of diseased colonies of bees, or of any infected appliances for bee-keeping, who knowingly sells or barters or gives away such diseased colonies or infected appliances shall, on conviction thereof, before any Justice of the Peace, be liable to fine not less than $50 or more than $100, or to imprisonment for any term not exceeding two months.

6. Any person whose bees have been destroyed or treated for foul brood who sells or offers for sale any bees, hives or appurtenances of any kind, after such destruction or treatment, and before being authorized by the inspector so to do, or who exposes in his bee-yard, or elsewhere, any infected comb, honey, or other infected thing, or conceals the fact that said disease exists among his bees, shall, on conviction before a Justice of the Peace, be liable to a fine of not less than $20 and not more than $50, or to imprisonment for a term not exceeding two months, and not less than one month.

7. Any owner or possessor of bees who refuses to allow the Inspector to freely examine said bees, or the premises in which they are kept, or who refuses to destroy the infected bees and appurtenances, or to permit them to be destroyed when so directed by the inspector, may, on the complaint of the inspector, be summoned before a Justice of the Peace, and, on conviction, shall be liable to a fine of not less than $25, and not more than $50 for the first offence, and not less than $50 and not more than $100 for the second and any subsequent offence, and the said Justice of the Peace shall make an order directing the said owner and possessor forthwith to carry out the directions of the inspector.

8. Where an owner or possessor of bees disobeys the directions of the said inspector, or offers resistance to, or obstructs the said inspector, a Justice of the Peace may, upon the complaint of the said inspector, cause a sufficient number of special constables to be sworn in, and such special constables shall, under the direction of the inspector, proceed to the premises of such owner or possessor and assist the inspector to seize all the diseased colonies and infected appurtenances and burn them forthwith, and if necessary the said inspector or constables may arrest the said owner or possessor and bring him before a Justice of the Peace to be dealt with according to the provisions of the preceding section of this Act.

9. Before proceeding against any person before a Justice of the Peace, the said inspector shall read over to such person the provisions of this Act or shall cause a copy thereof to be delivered to such persons.

10. Every bee-keeper or other person who is aware of the existence of foul brood, either in his own apiary or elsewhere, shall immediately notify the Minister of the existence of such disease, and in default of so doing shall, on summary conviction before a Justice of the Peace, be liable to a fine of $5 and costs.

11. Each inspector shall report to the Minister as to the inspection of any apiary in such form and manner as the Minister may direct, and all reports shall be filed in the Department of Agriculture, and shall be made public as the Minister may direct or upon order of the Legislative Assembly.

12. Chapter 283 of the Revised Statutes of Ontario, 1897, intituled "An Act for the Suppression of Foul Brood Among Bees," is repealed.

QUEBEC, 1908.

An Act for the Prevention and Treatment of Contagious Diseases in Bees.

(Chap. 26, 8 Ed. VII.)

[*Assented to 14th April, 1908.*]

His Majesty, with the advice and consent of the Legislative Council and of the Legislative Assembly of Quebec, enacts as follows:

Inspection of apiaries in certain cases.

1. The Minister of Agriculture, whenever he has reason to believe that any contagious disease or diseases, infects or infect certain apiaries, may appoint a competent person to inspect such apiaries, and to subject the bees therein, to suitable treatment.

Appointment and salary, etc., of inspector.

2. The said Minister shall appoint such inspector for a specified time, and may allow him a salary of not more than five dollars per day, together with his actual disbursements and travelling expenses.

Salary, etc., how paid.

3. The salary and disbursements and travelling expenses of such inspector, while in office, shall be payable by the Minister of Agriculture, out of the sum of fifty thousand dollars appropriated yearly for the payment of the grant to agricultural societies and farmer's clubs, under articles 1667 and 1671 of the Revised Statutes.

Visits and reports of inspector.

4. The inspector, when required so to do by the Minister of Agriculture, shall forthwith visit the apiary or apiaries indicated to him, and shall report to him as to the sanitary condition thereof in such manner and form as may be prescribed.

Treatment, etc., of bees, etc., in certain cases.

5. When a contagious disease has been discovered in an apiary, the Minister of Agriculture shall cause to be taken the measures necessary to subject the bees in said apiary to appropriate treatment, and, if necessary, he may order the bees affected, the hives occupied by them and all the accessories thereof which cannot be effectually disinfected, to be destroyed in presence of the inspector.

Destruction of hives, etc., if inspector's orders not obeyed.

6. If the proprietor or possessor of an apiary infected by a contagious disease, does not obey the orders which he receives for the treatment of sick bees, the Minister of Agriculture may order the destruction of the hives and of the bees and of all the accessories thereof which cannot be effectually disinfected.

Owner, etc., indemnified for hives, etc., destroyed.

7. 1—When the destruction of hives, bees, or accessories, is deemed necessary by the Minister, he shall indemnify the proprietor or possessor thereof, or both, as the case may be, upon an equitable basis, which shall be left to his discretion.

Proviso.

2—Nevertheless in the case of section 6, the proprietor or possessor of the hives, bees and accessories, shall be entitled to no indemnity.

Offences and penalties.

8. 1—Every proprietor or possessor of hives, bees and accessories, who knowingly sells, exchanges or otherwise alienates, any infected hives, bees or accessories, and every person who exposes to the open air any infected frames, honey-combs or objects whatsoever, or who conceals the existence of any contagious disease or diseases with which his bees may be infected, or who prevents the inspector from performing his duties, is guilty of an offence, and, upon summary conviction thereof, before a police magistrate or justice of the peace having jurisdiction where the offence was committed, shall be liable to a fine of not more than twenty dollars for the first offence, and of not more than fifty dollars for every subsequent offence.

2— Prosecutions in virtue of this Act, shall be brought and tried and decided in accordance with the provisions of part XV of the *Criminal Code*. Prosecutions, how brought.

9. Before bringing any prosecution against any person whom he thinks guilty of an infraction of the law, the inspector shall cause this Act to be read to such person before witness. Act to be read, etc., before prosecution.

10. The reports of the inspector shall be registered in the Department of Agriculture, and may be published by order of the Minister of Agriculture. Registration, etc., of inspector's reports.

11. This Act shall come into force on the day of its sanction. Coming into force.

BRITISH COLUMBIA.

(Chap. 18, 1 Geo. V.)

AN ACT FOR THE SUPPRESSION OF FOUL BROOD AMONG BEES.

[*1st March, 1911.*]

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of British Columbia, enacts as follows:—

1. This Act may be cited as the "Foul Brood Act, 1911." Short title.

2. (1.) The word "Minister," whenever used in this Act, shall mean the Minister of Finance and Agriculture for the Province of British Columbia. Interpretation.
(2.) The word "Inspector" shall mean Inspector of Apiaries for the Province of British Columbia.

3. The Lieutenent-Governor in Council may from time to time appoint such person or persons as he shall think proper to act as Inspector or Inspectors to carry out the provisions of this Act, and such Inspectors shall be under the direction and control of the Minister. Appointment of Inspectors.

4. (1.) The said Inspector shall, whenever so directed by the Minister, visit without unnecessary delay any locality in the Province of British Columbia and there examine such apiary or apiaries as the said Minister may direct, and ascertain whether or not the diseases known as "foul brood" or "black brood," or either of them, exist in such apiary or apiaries, or in their vicinity. Duties of Inspectors.
(2.) Wherever the said Inspector is satisfied of the existence of such disease in its virulent or malignant type, he shall order all colonies so affected, together with the hives occupied by them, and the contents of such hives and all tainted appurtenances or appliances that cannot be disinfected, to be immediately destroyed by fire under his personal direction and superintendence, and in such manner as may be necessary to prevent the spread of the said disease, and to thoroughly disinfect any appurtenances or appliances capable of being disinfected.
(3.) Where the Inspector, who shall be the sole judge thereof, is satisfied that the disease exists, but only in milder types and in its incipient stages, and is being or may be treated successfully, and has reason to believe that it may be entirely cured and eradicated, then the Inspector may omit to destroy or order the destruction of the colonies and hives in which such disease exists, but shall give the owner or caretaker of the diseased apiary or apiaries full instructions how to treat said cases. The Minister shall cause said apiary or apiaries to be visited from time to time, as he may deem best, and if after proper treatment the said bees shall not be cured of the disease, then he may cause the same, with the hives and all tainted appurtenances and appliances, to be destroyed as in the preceding subsection hereof provided.
(4.) After inspecting infected hives or fixtures or handling diseased bees, the Inspector shall, before leaving the premises, or inspecting any other colony of bees or proceeding to any other apiary, thoroughly disinfect his own person and clothing, and shall see that every assistant with him also thoroughly disinfects his person and clothing.

Box hives.

5. The Inspector shall have full power, in his discretion, to order any owner or possessor of bees dwelling in box hives (being mere boxes without frames) to transfer such bees to moveable frame hives within a specified time; and in default of such transfer, the Inspector may destroy or order the destruction of such box hives and the bees dwelling therein, or may himself cause such bees to be so transferred.

Penalty for disposing of infected bees or bee appliances.

6. Any owner or caretaker of diseased colonies of bees, or of any affected appliances, who knowingly sells, or barters, or gives away such diseased colonies or any bees, comb, or honey therefrom, or any infected appliances, shall, on conviction thereof before any Justice of the Peace, be liable to a fine of not less than fifty dollars and not more than one hundred dollars, or to imprisonment for any term not exceeding two months.

Selling bees after treatment, or exposing infected appliances.

7. Any person whose bees have been destroyed, or are being or have been treated for foul brood or black brood, who sells or offers for sale any honey-comb, honey, bees, hives, appurtenances, or appliances of any kind after such destruction or treatment, and before being authorised by the Inspector so to do, or who knowingly exposes in his bee-yard or elsewhere any infected comb, honey, or other infected thing, or conceals the fact that said disease exists among his bees, shall, on conviction before a Justice of the Peace, be liable to a fine of not less than twenty dollars and not more than fifty dollars, or to imprisonment for a term not exceeding two months and not less than one month, or both such fine and imprisonment.

Penalty for obstructing Inspector.

8. Any owner or caretaker of bees who refuses to allow the Inspector or his assistant or assistants to freely examine his bees or the premises in which they are kept, or who refuses to destroy the infected bees and appurtenances or to permit them to be destroyed, or who refuses to transfer bees dwelling in box hives to moveable frame hives, when so directed by the Inspector, shall, on conviction before a Justice of the Peace, be liable to a fine of not less than twenty-five dollars and not more than fifty dollars for the first offence, and not less than fifty dollars and not more than one hundred dollars for the second or any subsequent offence, and the said Justice of the Peace shall make an order directing the said owner or possessor forthwith to carry out the direction of the Inspector.

Special constables may be sworn in to assist Inspector.

9. When an owner or caretaker of bees disobeys the directions of the said Inspectors, or offers resistance to or obstructs the said Inspector in the performance of his duties, a Justice of the Peace shall, upon the demand of the said Inspector, cause a sufficient number of special constables to be sworn in, and such special constables shall, under the direction of the Inspector, proceed to the premises of such owner or caretaker and assist the Inspector to seize all the diseased colonies and infected appurtenances and appliances and burn them forthwith; and if necessary the said Inspector or constables may arrest the said owner or caretaker and bring him before a Justice of the Peace, to be dealt with according to the provisions of the preceding section of this Act.

Persons aware of disease to notify Minister.

10 Every bee-keeper or other person who is aware of the existence of foul brood or black brood, either in his own apiary or elsewhere, shall immediately notify the Minister of the existence of such disease, and in default of so doing shall, on summary conviction before a Justice of the Peace, be liable to a fine of not less than five dollars nor more than twenty-five dollars and costs for each such offence.

Minister may direct Inspector to examine premises.

11. Upon receiving the notice mentioned in the preceding section, or in any way becoming aware of the existence of foul brood in any locality, the said Minister may direct the said Inspector to immediately proceed to and inspect the infected premises; but where the person giving such notice is unknown to the Minister, or there is reason to believe that the information in said notice is untrustworthy, or that the person giving such notice is actuated by improper motives, then the Minister may require the person giving such notice to deposit with him such sum as the Minister may decide, not exceeding ten dollars, as a guarantee of good faith, before the said notice is acted upon, and if it proves that said notice was properly given, then the said deposit shall be returned to the person giving such notice, but otherwise the said deposit shall be forfeited.

12. The Minister shall h[illegible] power to order into quarantine at the point of entry into the Province [illegible]ish Columbia, or such other place as he may appoint, for a period of not more than nine months, and if found to be infected may order to be destroyed, any or all bees imported into the Province of British Columbia; also to order the disinfection of all bee appliances that have been in use, and to order the destruction by fire of all combs and frames in empty hives. Minister may order imported bees to be quarantined.

13. The Inspectors appointed under the provisions of this Act shall be paid such salary or remuneration as the Minister may from time to time determine. Remuneration to Inspector.

14. The Minister may from time to time, subject to the approval of the Lieutenant-Governor in Council, make rules and regulations for carrying out the purposes of this Act. Rules.