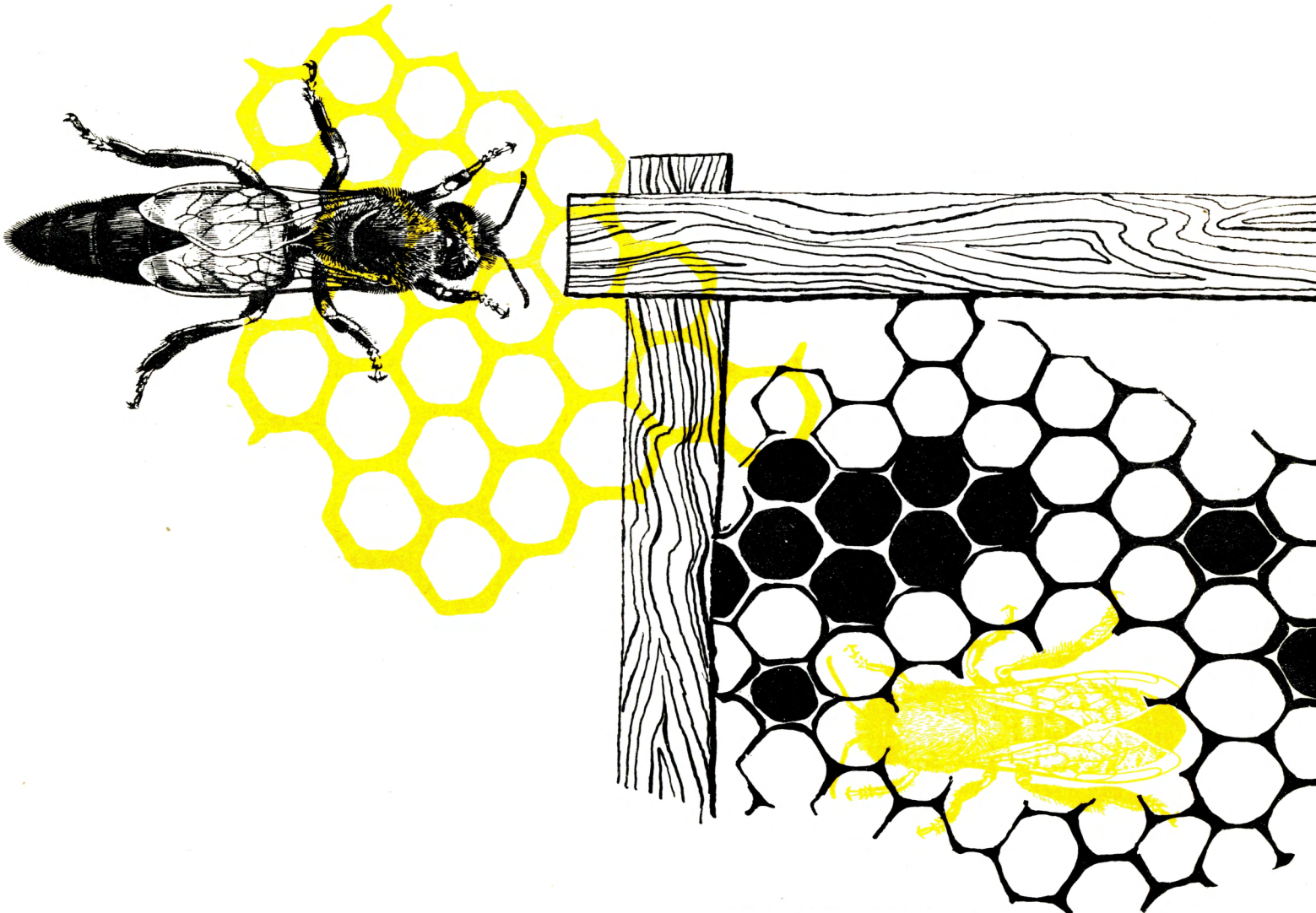


beekeeping

FOR BEGINNERS



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EXTENSION DIVISION
Shawnee Brown; Director
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BEEKEEPING FOR BEGINNERS

by

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INTRODUCTION

This circular is intended for 4-H bee club members who are just beginning beekeeping and for adults who possess very little or no knowledge of beekeeping. It does not go into discussion of various methods of beekeeping which professional beekeepers and bee hobbyists often like to discuss. It is our plan to give definite information on a simple, successful method of caring for a few colonies of bees.

There are some sections of Oklahoma where commercial beekeeping thrives and the beekeepers secure good yields of honey; there are other sections of the state where bees can scarcely make a living. Therefore, a person planning to keep bees should first make a study of the honey plants in his immediate vicinity as to the quality of honey they might produce and also the length and time of blooming period.

LIFE HISTORY OF THE HONEY BEE

It is important for a beginner to gain a brief knowledge of the life history of the honey bee. The normal colony consists of three forms of bees: namely, the queen, drones, and workers. The queen is the mother of the colony, being the only bee that normally deposits eggs. It is obvious, therefore, that a prolific queen is essential to a strong, efficient colony. The drone is the male bee and takes no part in the labors of the hive. The worker bee is a modified female. She performs practically all the labor of the hive, including gathering nectar and pollen, carrying water, building combs, ventilating the hive, feeding the developing bees, ripening and sealing honey.

There are thousands of worker bees in every normal colony, the number varying greatly, depending upon the season of the year. During winter and early spring there are fewer workers than in summer. It is obvious that in order to obtain the greatest possible amount of honey, there should be the largest number of workers in the hive at the time the nectar-producing plants come

into bloom. Normally there is but a single queen in a hive, while the number of drones may vary from none during the late fall and winter to several hundred during the brood-rearing season.

All bees pass through four stages in the course of their life cycle: namely, the egg, the larva (which is the worm stage), the pupa (which is the resting stage), and the adult. Each of the three forms requires varying lengths of time to pass through these stages as given in the following outline:

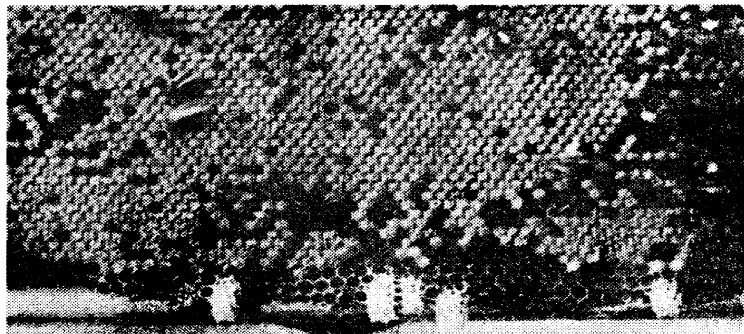
	Queen Days	Worker Days	Drone Days
Egg Stage -----	3	3	3
Larval Stage -----	8	10	13
Pupal Stage -----	4	8	8
Total period of growth-----	15	21	24
Hatching takes place on_____	4th day	4th day	4th day
Bee leaves its cell on_____	16th day	21st day	24th day
Bee Flies on_____	21st day	38th day	38th day

The developing bees from the egg stage to the time that they emerge from the combs as adults are commonly referred to as brood. The brood from which the drones emerge is called drone brood, while that from which workers emerge is known as worker brood.

THE QUEEN

The queen is hatched from the same kind of egg as the worker. After the egg hatches, the type of food that the larva receives determines whether it will develop into a worker or a queen. If the larva is fed on a very rich diet known as royal jelly, it will develop more rapidly and is destined to become a queen. In the event that the nurse bees intend for a larva to become a queen, they will enlarge its cell. This cell will be constructed at right angles to the other cells of the comb, the open end pointing downward. This is known as a queen cell and somewhat resembles a peanut in shape. Queen cells usually attain a length of about one and one quarter inches though there may be considerable variation.

Honey comb with queen cells

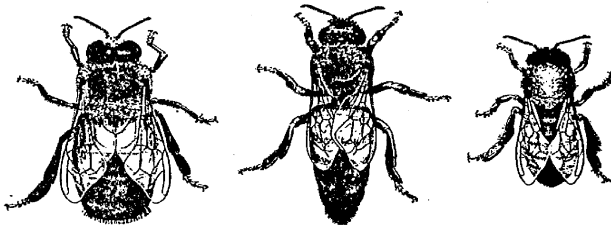


The queen is often considered to be the most important member of the colony. A queen that lays only a small number of eggs will never have a strong colony. Excessive production of drone eggs is a very undesirable quality in a queen since this type of offspring is consuming rather than producing. The merit of a queen can readily be judged by the uniformity with which she deposits eggs in the combs.

The queen normally produces two kinds of eggs, fertile and infertile. The fertile eggs develop into female bees, which, as already pointed out, may become either workers or queens, depending upon the type of food the larvae are given. The infertile eggs develop into drones. A queen that has never been fertilized will produce only drone eggs and is called a drone layer.

THE WORKER

The worker bees are modified females, the reproductive organs not being completely developed. In the event that the colony becomes queenless, certain of the worker bees sometimes become egg layers and produce infertile eggs which develop into under-sized drones. This condition can usually be detected by the occurrence of several eggs in the same cell and by the fact that they are not uniformly placed. It is also indicated by the presence of unevenly capped, dwarfed drone brood and the complete absence of worker brood.



Queen, worker, drone

THE STING

In the worker bee the ovipositor, or egg laying guide, is modified as a sting. This organ is the only means of protection against enemies. At the base of the sting are located two small pouches or sacs containing a fluid commonly called poison. A small quantity of this fluid injected into the wound made by the sting is the cause of the accompanying pain. When one has been stung he should immediately remove the sting. If the sting is removed by grasping between the fingers the poison sacs will be compressed and more poison will be forced into the wound. The sting should be quickly scraped out with one's finger nail. It is usually not

necessary to apply any further treatment; however, there are occasional individuals who are supersensitive to bee stings. Such persons when severely stung should be placed under the care of a competent physician.

DUTIES OF THE WORKERS

The workers normally perform the labors of the hive, such as taking care of the young brood, feeding and watering it, and regulating the temperature of the hive. When it becomes desirable to reduce the temperature in the hive, they set up a circulation of air from the outside by means of fanning. This ventilation of the hive can readily be observed by holding a lighted match or taper near the entrance of the hive, first on one side and then on the other. On one side it will be noticed that the flame is drawn into the hive, while on the other side the flame will be blown from the hive. This clearly indicates a complete current of air passing into and coming out of the hive.

Bees are cold blooded creatures and individually are incapable of controlling their body temperature. When the temperature drops below 57° in the hive, to keep warm they cluster tightly together on the combs to form a hollow sphere. Bees in the center of the cluster cause the temperature within the sphere to rise by rapidly fanning their wings or by other movements. The temperature in the hive outside the cluster drifts with the temperature outdoors.

For about the first 15 days after emergence, the workers are known as hive bees. During this period they devote their energies to caring for the brood and keeping the hive clean. For the next few days they are known as water carriers and go to the field in search of water for the use of the colony. After they have served as water carriers, they go to the field to collect nectar and pollen.

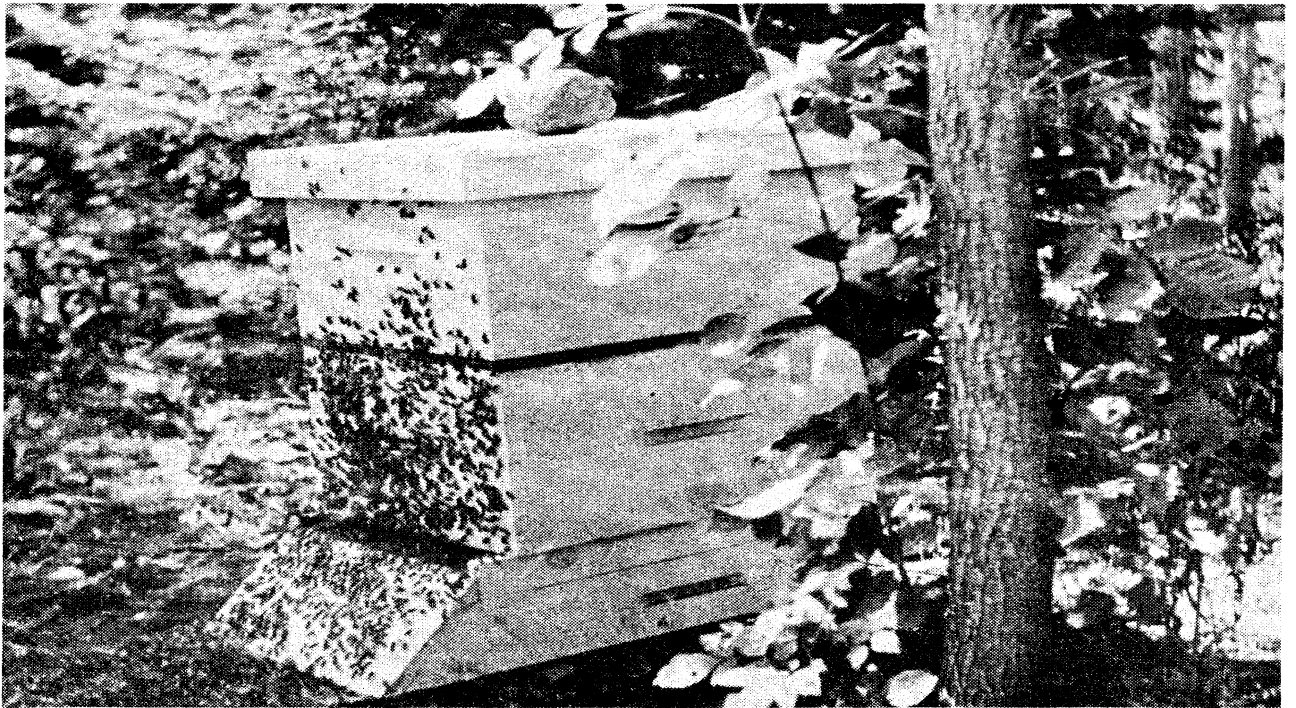
The excess moisture is evaporated from the nectar by the worker bees in the process of converting it into honey. This process entails frequent moving of the nectar from cell to cell and a great deal of fanning.

THE DRONE

Drone bees are males and perform no labors of the hive, their sole function being the fertilization of the queen. During the season of the year when there is no honey flow, the drones are less numerous in the hive and at certain periods are driven from the hive by the workers to perish. It is very uncommon to find drones present in the hive during the winter.

SWARMING

Continued production of brood so increases the strength of the colony that the balance of population within the hive is destroyed, and a congested condition arises. This condition is remedied and the balance restored by the development of a new queen. When this occurs, the old queen, with a portion of the hive inhabitants, leaves the parent hive in search of a new home. This outgoing company of bees is called a swarm and the act of going forth is called swarming. Swarming produces an increase in the number of colonies and in olden times was considered as the measuring stick for good beekeeping. The production of a large number of swarms was thought to indicate successful beekeeping. With our present day knowledge it is known that excessive swarming is very undesirable.



Hiving a swarm of bees

When the colony becomes congested, the workers start developing a number of queen cells. Shortly after the queen cells are sealed, the old queen, accompanied by a large number of the workers leave the hive. These bees travel in a dense swarm until they find a desirable place to settle, when they alight and cluster in a compact mass, usually upon the limb of a tree. If the swarm is not hived soon after settling, the bees will again take flight for a hollow tree or some other suitable place in which to establish their future home.

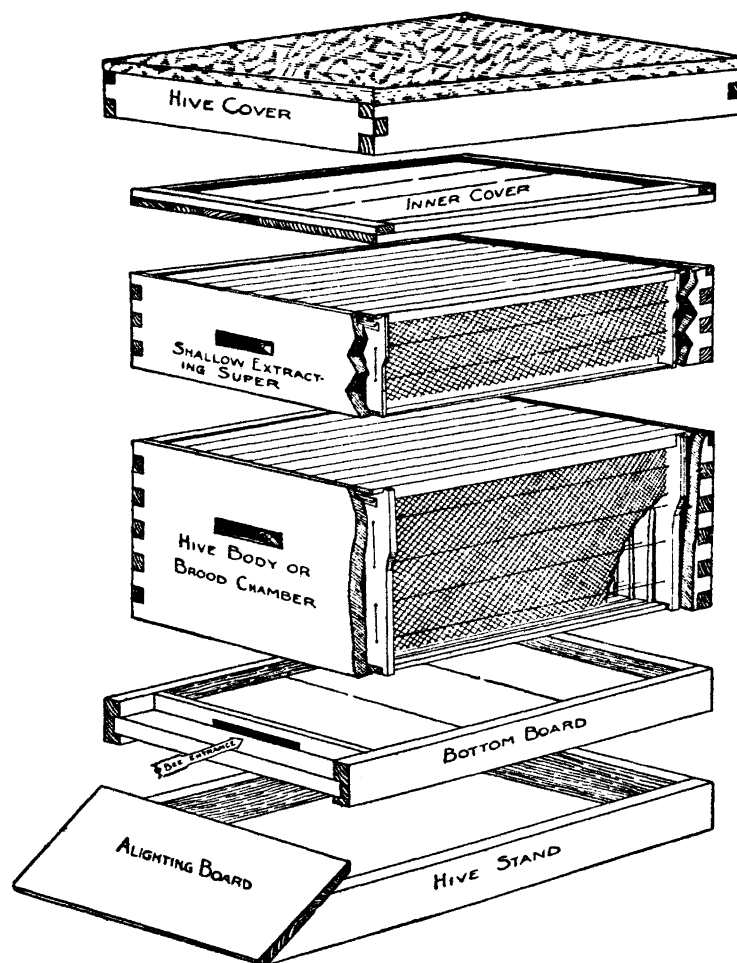
In the parent hive the first queen that emerges from her cell will generally destroy all unemerged queens, but occasionally for some unknown reason, the new queen will follow the example of her mother and depart from the hive in company with a small group of workers. This cluster of bees is commonly called an after-swarm, and is one of the most undesirable features of swarming. The after-swarm is usually too small to make a satisfactory colony and in addition it weakens the parent colony. It is not infrequent for a colony to throw off several after-swarms and this condition is referred to as "swarming to death."

Beginning Beekeeping

Probably as many persons start in beekeeping by accident as from choice. A. I. Root, who was one of the most prominent beekeepers of the world, caught a stray swarm and got his start in bees in that way. For the beginner in beekeeping there are many things to learn. The terms used in describing operations and the names applied to various things with which a beekeeper has to deal make up a beekeeping language with which he can not dispense.

The Hive and Its Parts

The beehive, or hive as it is usually called, is the house in which the colony lives. It is composed of the following parts: bottom board, hive body, frames, inner cover, and top. The bottom board is the floor of the beehive. It is so constructed that by merely turning it over, two different heights of entrance may be supplied to the hive. The bottom projects out in front of the hive about two and one-half inches to provide a lighting board upon which the incoming bees may land. The hive body constitutes the walls of the hive and fits upon the bottom board. A rabbet is cut in the upper edge of the ends of the hive body to provide a support for the frames. The frames are so constructed that they hang free from this rabbet. Their function is the support of the combs. In order to obtain satisfactory combs, it is customary to fasten in the frames sheets of beeswax upon which has been embossed the bases of cells of worker comb. This material is known as comb foundation. The frames in the hive body are usually called brood frames because of the fact that they support the combs in which the brood is reared. Many beekeepers speak of the hive body with



Hive showing proper relation of parts

its frames and brood comb as the brood nest, and it is a very convenient way of referring to that portion of the hive. The top is the roof of the hive. Its function is to close the hive and protect it from weather conditions. A good top is very essential to successful beekeeping. There are several types of tops or covers, as they are sometimes called. The beginner need not be greatly troubled about selecting a suitable cover as he will likely form a very decided preference from his own experience as time goes on. The metal telescope cover is one of the most satisfactory for general beekeeping. The top is composed of two parts, an outer and an inner cover. The inner cover is made of thin lumber and fits directly on top of the hive body. The outer cover fits over the top of the hive body and rests on cleats on the upper side of the inner cover which allows for air space between the two. This air space is of considerable value in protecting the colony from excessive heat in summer and cold during winter.

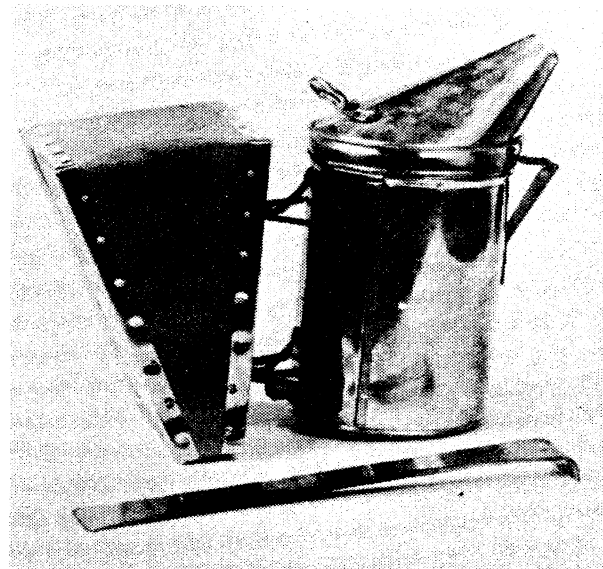
The super is the portion of the hive used for honey storage. For the beginner the shallow super is the most advisable. It is about half the depth of the hive body and is equipped with frames for holding the combs. These frames are supported on rabbets cut in the ends of the super as in the case of the hive body. These frames should be equipped with a narrow strip or full sheets of foundation which will induce the bees to build the storage combs straight in the frames. This type of super is adapted to the production of extracted or bulk comb honey.

A special type of super is used in the production of section comb honey. This super is provided with frame supports for holding the sections. The beginner should not attempt to produce section comb honey as it involves a very intimate knowledge of bee behavior.

It is sometimes desirable to keep the queen in the brood nest and prevent her invading the super. This is accomplished by use of a queen excluder, which permits the workers to pass freely but excludes the queen or drones from the super. For the queen excluder to be effective it must fit the top of the hive. There are two types in general use: the perforated zinc excluder, and the wood and wire excluder which is composed of strips of wood and parallel wire gratings. The two types are about equally efficient.

Beekeeping Tools

There are certain tools which are essential in manipulating bees; they are hive tool, smoker, bee veil, and gloves. The smoker is a metal, can-shaped fire box with a bellows attached. When the bellows are pumped, air is forced into the fire box and in turn smoke is driven out of the nozzle. A good smoker is one of the most important tools that the beekeeper has. Cotton rags or punk are used as fuel in the smoker, the smoke from these materials being rather cool and not irritating to the bees.



Smoker and hive tool

The hive tool is a flat, chisel-shaped piece of steel used in separating the various parts of the hive and is indispensable in the apiary.

The bee veil is made of either netting of wire or tulle and is constructed in such a way that it can be pulled over the head and around the neck of the wearer. It will not interfere seriously with the vision but it will prevent the bees from coming in contact with the wearer's face. It should be made of dark material as it is difficult to see distinctly through a white veil.

Bee gloves are made of heavy drill and extend to the elbows the upper end of the sleeves being equipped with an elastic band to hold it closely to the arm and thus prevent the entrance of bees.

For those who wish to produce extracted honey, a honey extractor is a very desirable piece of equipment. It consists of a metal tank containing revolving baskets which are operated by means of a crank or motor. The purpose of the extractor is to throw the honey out of the combs without destroying them. By its use the production may be increased by about 25 percent. It is not advisable that the beekeeper invest in an extractor until his honey production will warrant the expense.

Care of Equipment

Equipment such as bottom boards, hive bodies, supers, and covers should be well nailed when they are assembled. They should then be given two coats of good white paint on all surfaces that will be exposed to the weather. It is not necessary or desirable to paint the inner surfaces, except those of the bottom board. All surfaces of the bottom board should be painted as a new set of surfaces are exposed when it is reversed. When not in use, equipment should be stored in a dry place where it can be kept as free from dust as possible. It is well to stack the bodies and supers in piles and to put a cover on top. When combs are to be stored, they should be carefully fumigated with carbon bisulphide or paradichlorobenzene as discussed on page 23.

The smoker should always be emptied after using to make sure that no fire is left in it. It should be stored in a dry place to prevent rusting of the metal and mildewing of the leather. A good plan is to have a box in the work shop in which to keep the smoker, hive tool, and such other tools as are frequently used in the apiary.

Frames should always be stored in hive bodies or supers because if they are piled up together they are likely to be broken or twisted out of shape. Broken or misshapen frames are useless and should always be discarded.

Products of the Apiary

Honey is the most important product of the apiary. From it the beekeeper derives his pay for caring for the apiary. The bees gather the nectar from the flowers and store it in the honey combs. When it is first gathered, it is very thin and watery. By fanning and moving the nectar from place to place the bees reduce the amount of water it contains. This process is known as ripening. When honey is fully ripened, it is thick and heavy. It should weigh about 12 pounds to the gallon and contain less than 25 percent water.

There are three classes of honey to be found on the market: comb, bulk comb, and extracted. Comb honey is stored in little rectangular box-like frames, called sections.

By bulk comb honey is meant a mixture of honey in the comb and honey that has been removed from the comb. It is the easiest kind for the beginner to produce.

Extracted honey is that which has been removed from the comb. Commercially it is removed by means of a centrifugal machine known as an extractor. It can be produced more efficiently than any other class of honey.

Wax, the substance from which combs are made, is another important product of the apiary. It is a secretion from glands on the lower side of the abdomen of the bee and appears in the form of very thin white scales or flakes. The bees collect these wax scales and work them into combs with their mandibles. Beeswax may be recovered from old comb or the bits of wax that are scraped off the frames in the process of working bees. These bits of comb should be placed in a porous sack and then boiled in water until all the wax is liquified. It can then be allowed to cool and the wax will collect and harden in a layer on the surface of the water. This is a readily marketable product and may be considered an additional source of revenue not to be overlooked.

It requires 20 or more pounds of honey eaten by the bees to produce a single pound of beeswax. It is, therefore, to the advantage of the beekeeper to see that his bees do not have to build any more comb than necessary. He can accomplish this by the use of comb foundation.

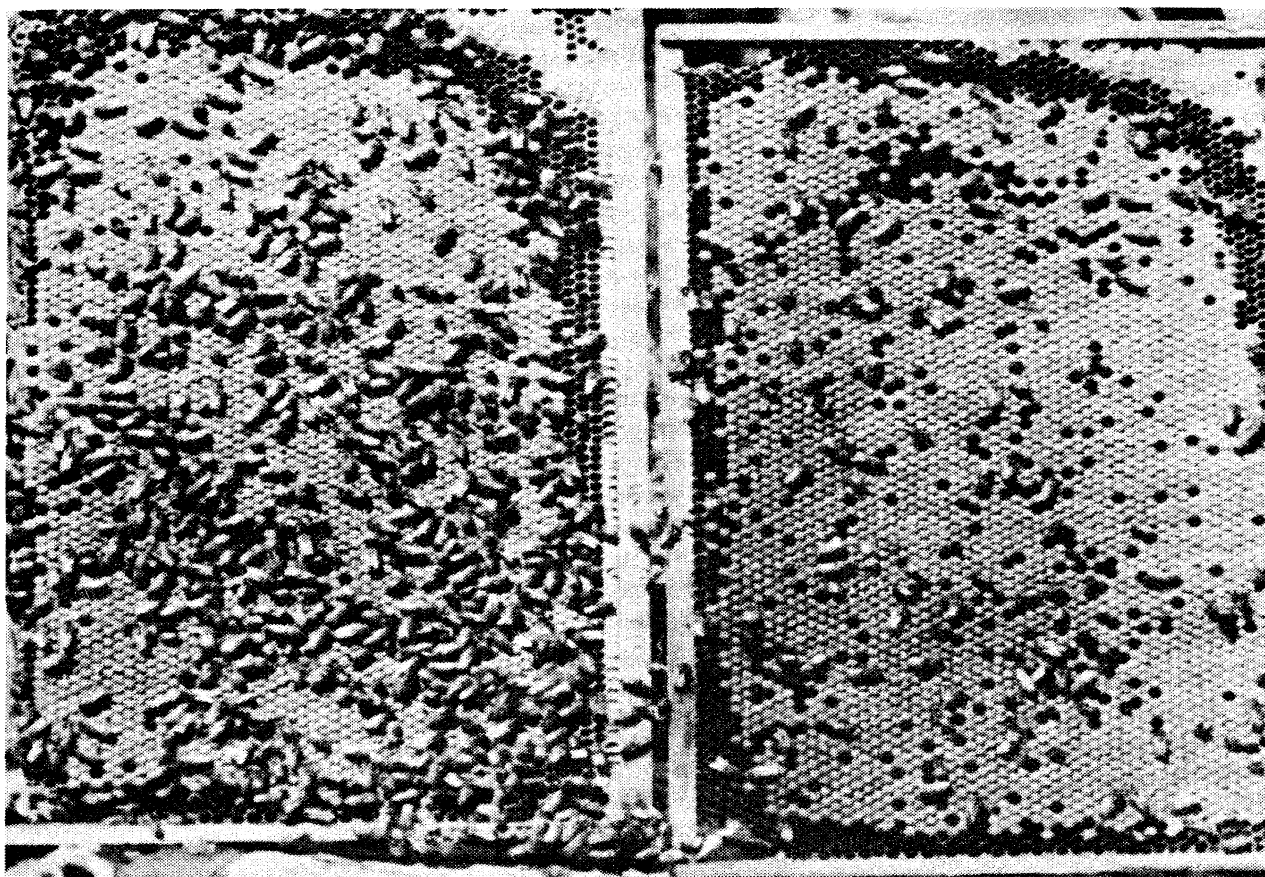
Pollen is collected by the bees from the flowers. The bees mix it with just enough honey to make it stick together and store it in the cells of the comb. This is known as bee bread and is the protein of the bees' diet. Pollen varies widely in color, ranging from almost black through red, orange-yellow, gray, to a pale green. It is impossible for bees to rear broods without pollen and it is not uncommon for an absence of this material to weaken a colony seriously.

Propolis is a compound that the bees collect from the buds of certain plants. It is often called bee glue and is used to seal portions of the hive together. The bees spread it out in a thin layer over the inner surface of the hive to form a sort of varnish. It is of little or no commercial value.

Royal jelly is a blue-white rich food which is a secretion coming from glands in the head of nurse bees and is supplied without the addition of honey or pollen to queens throughout their larval stage and to worker larvae less than 3 days old. It is also supplied to drone larvae with the addition of honey and pollen.

Combs

Good combs are essential to successful beekeeping. As has already been indicated, two kinds of comb are to be found in a beehive; they are worker comb and drone comb. A worker comb is one in which worker brood may be reared. The cells are small, averaging about five to the linear inch and 29 per square inch. The cells of the drone comb are much larger, there being four to the linear inch. When the bees are permitted to build comb without foundation being furnished, they will usually build some drone and some worker comb. This forms an irregular comb which is not desirable in the modern hive. Where comb foundation is used, it is possible to obtain comb consisting almost entirely of worker cells. Good combs, free from drone cells, also materially aid in controlling the number of drones in the hive. In order that combs may be readily handled in a hive, it is desirable that they be free from bulges and waves which would interfere with the easy removal or manipulation of the frames. Practical beekeepers usually wire the brood frames with number 28 tinned wire which is imbedded in the foundation by means of a wire imbedder. Combs



Frames of well-sealed brood

that are not supported by wire will often sag and produce a large number of cells which are unsuited to the rearing of brood. The wiring also makes the combs a great deal stronger and there is less likelihood of their breaking out of the frames while being handled by the beekeeper. Comb foundation with wire imbedded in a vertical position is also available on the market.

When the extracted honey is being produced, the combs are saved and used over and over. The plan involved is to cut the sealed combs and remove the honey by means of an extractor. A considerable saving of comb building is effected by this process.

Races of Bees

There are several races of bees to be found in the United States. The most common of these are the Italian, black or German, Caucasian, and mixtures of two or more of these. Italian bees are generally conceded by beekeepers in this country to be the most popular race; nevertheless, all of them have their admirers.

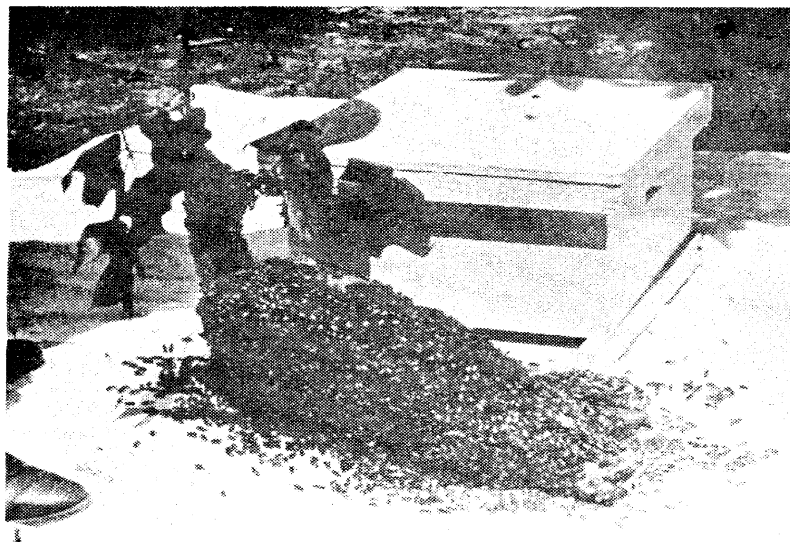
There are three strains of Italians, namely, the "three-banded," "leather colored," and "golden," named according to their color markings. "Three-banded" and "leather colored" Italian bees are usually quiet and easy to handle. They are excellent housekeepers and are generally considered more resistant to the attack of certain diseases than the other races. They are good workers and are not excessive swarmers. The golden Italians are beautiful bees to look at but are inclined to be erratic in temperament. They are good housekeepers and are not overly susceptible to disease.

The black or German bees are considered the best for finishing comb honey but are difficult to handle as they are nervous and ill-tempered. Their lack of resistance to foulbrood and their poor housekeeping make them less desirable.

Caucasians are gray in color and are liked by many beekeepers because they are gentle, prolific, and winter well. Unfavorable characteristics are said to be their excessive use of propolis, construction of burr and bridge combs, which interfere with the ease of handling and manipulating the frames. Experience with this race of bees at Stillwater shows these traits to be no more objectionable than in other races. Hybrid bees are often very good honey gatherers but are likely to be cross and difficult to manipulate.

MAKING A START IN BEES

In nearly every community there are a few hives of bees and the beginner usually can obtain swarms from these colonies quite reasonably. A good swarm introduced into a modern hive equipped with full sheets of foundation in the frames will soon build up an excellent colony of bees. When this can be done, it is by far the most satisfactory method of obtaining a start in bees. It has the advantage of allowing the owner to become thoroughly familiar with the modern hive before he has



A good swarm being introduced in modern hive

any bees in it to interfere with his studies. Furthermore, a swarm will start off more readily and make better headway in an empty hive than any other type of beginning colony. In addition to this it is usually less expensive than other plans.

Another method often used is to purchase full colonies of bees. This is a good way to get a start, but it has a number of serious drawbacks. If the colony can be secured in the immediate neighborhood, the question of expense is not so pronounced.

Frequently bees may be secured at a low price in hives that are not modern. These should be transferred at once to standard equipment. This is quite an undertaking for the beginner, but if he successfully performs this operation, he will acquire much valuable experience. There is, of course, the possibility of obtaining disease along with these box hives and careful examination by an experienced beekeeper before purchasing is advisable.

Bees in combless packages are sold by the pound, usually in one, two, or three pound packages, though other sizes are available. A queen may be purchased with a combless package. These bees with their queen may be introduced into a fully equipped hive at the beginning of the honey flow and will build up almost as well as a swarm, though the introduction requires considerable skill. There is little or no danger of transmitting disease through combless package bees.

The most desirable way of obtaining a start in bees is to purchase a swarm near home, providing a new hive into which they are introduced by their original owner. They should be moved as soon as they have become quiet, usually within 24 hours.

LOCATION

The selection of a location for an apiary should be given careful consideration. There must be an adequate supply of nectar-producing plants with an available supply of water near at hand.

Honey Plants

It is important for the beekeeper to know the nectar secreting plants in his community. This information can only be gathered by a careful study of the plants in this vicinity. Some of the most valuable honey plants in Oklahoma are: elm, dandelion, horehound, alfalfa, sumac, sweet clover, white clover, basswood, horsemint, button willow, goldenrod, morning glory, aster, Spanish needles, and smart weed. These honey plants may be separated into two groups: those that furnish a surplus of honey, and those that furnish only enough to promote brood rearing and keep the colonies alive. Some of the important plants that are generally considered as surplus producing are sweet clover, alfalfa,

persimmon, sumac, horsemint, Spanish needle, bitter weed, tie vine, smart weed and cotton. Bees normally travel a maximum distance of about two miles in search of nectar and this fact must be taken into account in locating an apiary.

Water Supply

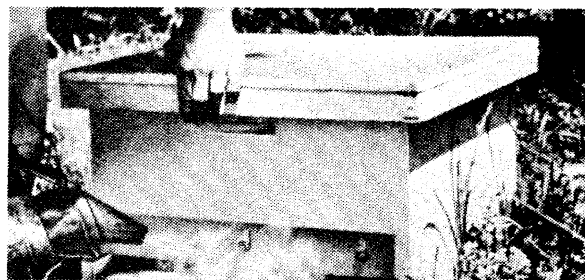
Bees, like all other animals, require a certain amount of water. It is, therefore, important that in locating an apiary there be an adequate supply of fresh water near at hand.

BEEKEEPING OPERATIONS

A knowledge of certain operations is essential to the beginning beekeeper. It is the purpose of the following discussion to acquaint the beginner with a satisfactory method of performing these operations. No attempt is made at a comparison of the merits of various methods.

Opening the Hive

The first step is to light the smoker and get it going well. The operator should watch the line of flight and stand on the opposite side of the hive and puff a little smoke into the hive entrance. The inner cover should then be gently pried off with the hive tool and at the same time blow a puff of smoke into the opening. Then one of the wall combs can be lifted out. This gives an abundance of room to remove the brood comb with the adhering bees. All motions in working with bees should be smooth and free from jerking, jarring, or uncertainty. In smoking the bees avoid hard puffing; the smoke should be so applied as to drift gently over the bees.



**Proper use of smoker
in opening hive**

Transferring

Transferring in beekeeping means the moving of bees from a box hive or gum to a modern hive. There are a great many ways of effecting this transfer and the experienced beekeeper usually makes use of the one that lends itself best to the individual case in hand. The beginner, however, has no similar store of information upon which to draw. He must, therefore, follow one plan until he has acquired sufficient experience to enable him to vary the procedure. A plan that will give uniformly satisfactory results is as follows: all of the equipment and tools that are to be

used in the transfer should be assembled before starting the task. These include a ball of strong cord or twine, knife, pan of water, lighted smoker, hammer, flat board similar to a hive cover, and a complete hive with all but three or four frames equipped with full sheets of foundation or fully-drawn combs, the other frames being empty. A pail or pan in which to place honey and bits of comb is also desirable and should be provided with a cover.

The bees in the box hive should be thoroughly smoked and then given about two or three minutes to fill up on honey. The top and bottom of the box hive should then be removed. It should then be placed on its side with the top about three or four inches from and on a level with the entrance to the new hive. A board may be placed across the upper side of the box hive to the top of the new hive. Smoke should be forced into the bottom of the box hive, taking care not to get the combs warm enough to melt. The smoke will drive the bees out at the other end of the box hive. They will cluster on the end of the hive or the board that has been laid across the two hives. These should be brushed or shaken off on the entrance board to the new hive and if they do not crawl in readily, may be gently brushed in. This operation may be repeated two or three times until the greater part of the bees have been transferred to the new hive. Or if you prefer you can drive the bees up into the new hive. The box hive should be moved from in front of the new hive and one of its sides removed. The combs in the box hive should be cut loose one at a time. The outside ones will likely be empty and should be laid aside. As soon as a comb is found that contains a considerable amount of brood it should be placed on a flat board and with one of the frames as a measure, it should be trimmed to fit the frame as nearly as possible. String should be wrapped around the frame and the brood so as to hold the comb securely in place. The frame containing the tied-in comb may now be placed in its proper position in the new hive. This operation should be repeated until all the combs of worker brood have been thus disposed of. It may be that the pieces of comb containing brood are not large enough to fill an entire frame. In this event two or three pieces may be fitted into a single frame. In the course of a few days the bees will attach the combs to the frames, and the strings may be removed if the bees have not already done so.

All combs containing any honey should be carefully gathered up and placed where the bees cannot find them because this may start robbing. The old box hive should also be removed from the vicinity and if any honey is wasted on the ground the hose should be turned on it or the honey covered with soil.

Bees may be transferred any time during a nectar flow but it is better to transfer during the first nectar flow of the spring as the bees will have less honey in the comb at that time and there will be a much smaller loss. The colony will also have a much

better opportunity to build up and recover than if the transfer was performed later in the season.

Requeening

A queen bee may live to be several years old. In fact there are authentic records that queens have attained the age of 12 years. After a queen has passed through one or at the most, two seasons of heavy brood rearing, however, she is of little value to a honey-producing colony. If the colony is permitted to swarm, the queen will be replaced. In beekeeping practices it is not always desirable to permit swarming and in this case requeening becomes necessary. Requeening is also often employed as a means of improving the stock.

Queen bees may be reared by the beekeeper but usually for the small apiary it is preferable to secure them from the commercial queen breeder, at which time the race of bees may be changed by introducing a queen of the desired race. The queen will be shipped by mail in a small wood and wire cage containing food and several attendant bees. A piece of pasteboard will be tacked over the screen wire that forms the top of the cage. On the pasteboard box covering you will find specific directions for introducing the queen. Be sure to follow these directions. It is not advisable to attempt to requeen a colony that has been queenless for a considerable length of time as such a colony will not accept a queen. It should, instead, be united with a strong colony.

Uniting

By uniting is meant the combining of two or more colonies of bees. This is a procedure which is usually followed when it is desired to strengthen weak colonies quickly. To unite two colonies remove the cover from the stronger of the two and spread two thicknesses of newspaper over the top of the hive. Then place the other hive with the bottom removed, on top of the paper so that the walls of the two hives exactly coincide. The bees will cut through the paper and the colonies will thus be united. If one of the queens is superior to the other, the poorer of the two should be killed before uniting the colonies. It usually takes only a day or two for the bees to work their way through the paper and become established.

Feeding

It frequently becomes necessary to feed bees either to augment their store of honey or to stimulate brood rearing. A simple method is to perforate the lid of a friction top pail with six or more holes about the size of an ordinary pin. Fill the pail with a

syrup made by dissolving a quantity of granulated sugar in an equal volume of lukewarm water. Do not attempt to cook the mixture as the least scorching will kill the bees. Then place the lid on the pail tightly and invert on the top bars of the frames or directly above the opening in the inner cover. An extra hive body must be placed on the hive around the pail and the hive cover replaced. The syrup will be removed through the holes in the lid by the bees. A colony should carry down and store the contents of a five-pound pail in a single night. It is not advisable to give a colony more than five pounds of syrup at a time except in cases where they are very low in stores when the feed may be increased to as much as 10 pounds.

Honey is not satisfactory feed as its use is liable to excite robbing. Cane sugar is usually considered as the best feed for bees. Brown sugars, corn syrup, and glucose should not be fed to bees. They are likely to produce dysentery.

Swarm Control

The beekeeper who wishes to obtain a good crop of honey should watch his hives and see that they do not swarm, as swarming is detrimental to honey production. Many plans are used to prevent swarming. Some of them involve an intimate knowledge of bee behavior. Two methods are advantageous to the beginner. As the colonies become strong in the spring, the bottom board should be turned over so as to provide the widest possible entrance. The beekeeper should go through the colony every five to seven days and examine the combs for queen cells. When queen cells are found, they should be destroyed by pinching out. At all times the colony should have an abundance of empty comb in which to rear brood and store honey.

A second method is perhaps the most reliable one known. It is easy to follow and does not require so much of the beekeeper's attention. In the spring as soon as the brood chamber is filled, add another and put half of the brood frames in the second story. Have the frames in both stories in the central part of the hive. Fill the vacant spaces with empty comb or foundation. As the time approaches for swarming spread the brood by alternating the full frames with the empty ones from the sides. A hive so treated rarely swarms if supers are supplied to it as soon as the two chambers are well occupied. A colony that has been transferred early in the spring rarely swarms that year. Bees will always swarm if there is not room for rearing brood and they cannot store honey unless they have a place to put it. In spite of the best control measures a swarm will occasionally issue. It should be shaken into an empty hive equipped with full sheets of

foundation. A frame of unsealed brood inserted in the hive in exchange for one of the sheets of foundation will materially help in getting the swarm established.

Harvesting the Honey Crop

Honey should never be taken off the colonies until it is thoroughly ripe. On the other hand it is not advisable to leave a surplus in the hives longer than is necessary since it results in an over-crowded condition and the comb becomes travel stained. In taking honey away from a hive, the combs may be lifted out of the super and selected. Those that are ready to take off should be placed in a comb box or another hive body and carried into the house. To remove the comb from the frame, lay it on the table and cut around the inner surface of the frame. The frame may now be removed and the honey cut in suitable sizes for packing in jars. The most approved method of packing bulk honey is to cut a section of comb honey that will just pass through the mouth of the jar without breaking the corners of the comb. Ordinarily one such piece is placed in a two-pound container. When the comb honey has been placed in the jar, pour extracted honey over it until the jar is filled. The extracted honey to fill the jars may be obtained by squeezing or extracting the honey from combs that are not suitable for packing as comb honey or from combs to be used again. The honey thus obtained should be strained through a cheese cloth to remove foreign particles.

If the beekeeper has an extractor he should cut the caps from both sides of the filled comb with a capping knife. Then place the combs in the extractor and whirl it for a few minutes. Then reverse, and whirl again. This operation should be repeated for a few times until the combs are empty. The empty combs should be returned to the hives for cleaning and for refilling. Extreme care must be used to see that no honey is wasted which may cause robbing.

After the honey is drawn out of the extractor, it should be strained through several thicknesses of cheesecloth to remove foreign particles such as bits of comb. These particles may also be removed by placing the honey into large containers and allowing it to stand for several days



Harvesting the honey crop

during which the particles will rise to the surface and may be removed. It is then ready to be packed in jars or other containers.

It is advisable to remove the honey from the colonies only after it has been thoroughly ripened, which is usually immediately after the main nectar flow. If this is done at a time when a small quantity of nectar is coming in, there is danger of robbing.

Uses of Honey

In its natural state honey is often served in preserves, jellies, jams, and conserves and because of its delicate flavor and its sweet taste, it is especially adapted to this purpose. It is also used as an ingredient in cooked foods, such as cookies, cakes, brown bread, honey bread, muffins, and candies of various kinds. U.S.D.A. leaflet No. 113 contains many good honey recipes as does "One Hundred Honey Helpings" published by the American Honey Institute.

Wintering Honey Bees

At the end of the honey flow which is usually about frost time depending on the season, the beekeeper should prepare his bees for the winter. Each colony should have between 40 and 50 pounds of sealed honey. In case any colony is found to have an inadequate supply of honey for the winter, it should be fed. Honey from disease-free colonies in the brood combs is the best food. If this is not available, use sugar and water as previously described under feeding.

Some type of windbreak should be provided. Dense hedges or a board fence make excellent windbreaks. The hives should be placed facing south and the entrances reduced so that only a few bees can come and go at a time.

BEE DISEASE

There are a number of diseases which attack bees. These are divided into two groups: brood diseases and diseases of the adult bees. There are three important brood diseases in the United States: American foulbrood, European foulbrood, and sac brood. American foulbrood is by far the most important. It is a bacterial disease which kills the larvae after the cells have been capped over. The dead larvae are flattened down in the cells and turn dark brown in color. If a toothpick is inserted into the mass and withdrawn, part of the decayed substance will adhere to the toothpick and form a smooth ropy string. If this condition is observed in the hive an experienced beekeeper should be consulted at once. Work is now being done on developing a strain of queens,

the progeny of which are resistant to American foulbrood. However, until more definite information is available it is well to follow the usual procedure in foulbrood control.

European foulbrood attacks the larvae at a much earlier stage in their growth than American foulbrood and kills them before the cells are capped over. This disease is far less common in Oklahoma than American foulbrood.

Sac brood is by far the least serious of the brood diseases. In some ways it resembles American foulbrood and it is sometimes difficult to distinguish between them. The greatest danger from sac brood is that it may be confused with American foulbrood. It seldom causes any considerable loss.

The adult bee diseases are far less definite. The most important ones are dysentery and paralysis. Dysentery results from an accumulation of non-digestible substances in the digestive tract of the bee. It is usually the result of consuming poor stores. Paralysis is a condition of the adult bees in which they apparently lose control of their legs and tremble as if afflicted with palsy. It is not definitely known what causes the disorder.

WAX MOTH

In addition to the bee diseases already mentioned, the bees have a number of natural enemies, though as a rule relatively unimportant. The most important of these enemies is the wax moth. The wax moth does not do any damage to strong healthy colonies of bees that have been given proper care. Finding the wax moth in a hive usually indicates weakness of the colony which may have been caused by the colony being queenless, the queen becoming weakened, insufficient proper stores, or some brood disease.

The adult moth lays the egg in the crevices of the hive and the larvae that hatch from them destroy the combs by burrowing through them, and constructing tunnels of silk as they burrow. The larvae feed on pollen, cocoons, and other materials in the comb. The wax moth will completely destroy the combs that may be removed for storage unless they are given proper protection and fumigation.

Strong healthy colonies, such as Italian bees, will not tolerate the presence of the wax moth. Consequently, it is possible to clear up a weak, infested colony by uniting it with a strong, healthy one.

Fumigation

Combs that are stored should be fumigated and stored in such a manner as to prevent the adult moths from reinfesting them. To fumigate, the supers may be stacked in tiers with an empty super at the top into which a shallow dish containing carbon bisulphide is placed at the rate of 1 tablespoonful for each full depth super. The gas given off as the liquid evaporates, settles down through the combs and kills the larvae. Eggs are not destroyed by carbon bisulphide, so it is necessary to give the combs another fumigation after two or three weeks. For best results, the fumigation should be repeated in 10 days with temperature above 60° F. *Carbon bisulphide is highly inflammable and fires of any sort should not be brought near the place where the fumigation is taking place.*

Another fumigant that give excellent results and is noninjurious and noninflammable is paradichlorobenzene, a white crystalline substance, that changes slowly to a gas if exposed to air. In fumigating with this material, the supers should be stacked and the cracks sealed as tightly as possible. A handful of the crystals should be placed on top of the frames of the top super after which the cover is put in place to fit tightly. The storage supers should be examined at intervals and unless crystals are present more should be added.

ROBBING

Robbing, when it occurs, is a condition almost as serious as any disease and every precaution should be taken to prevent it. As the name implies, robbing is the theft of honey from one colony by bees of another colony. The members of the colony being robbed attempt to protect their stores and as a result many bees, both defenders and invaders, are killed and the strength of the hives is seriously depleted.

Robbing is much more easily avoided than stopped once it is started. It may be caused by improper feeding, scattering honey around hives, leaving hives improperly covered, exposing combs to bees, or working with bees when there is no nectar flow. A careful attention to the proper performance of these operations is the best protection against robbing.

To check robbing after it has started, the entrance to the hive should be reduced and lightly covered with grass or weeds, Sprinkling the hive with water and covering it with wet blankets will often greatly help.

LITERATURE

Beekeepers that desire more information on beekeeping can secure it by reading books on beekeeping. The following are a few of the books we recommend for beginners.

The Hive and the Honey Bee, by Grant, Dadant and Sons,
Hamilton, Illinois

ABC and XYZ of Bee Culture, by A. I. and E. R. Root.
The A. I. Root Co., Medina, Ohio.

Honey Bees and Their Management, by Frank Shaw and
Stanly B. Whitehead. Van Nostrand Co., Inc.

Beekeeping for Profit and Pleasure, by Addison Webb.
Macmillan.

Beekeeping magazines are also a good source of information.
The ones best suited for this section of the country are:

American Bee Journal, Hamilton, Illinois

Gleanings in Bee Culture, Medina, Ohio

Modern Beekeeping, Paducah, Kentucky