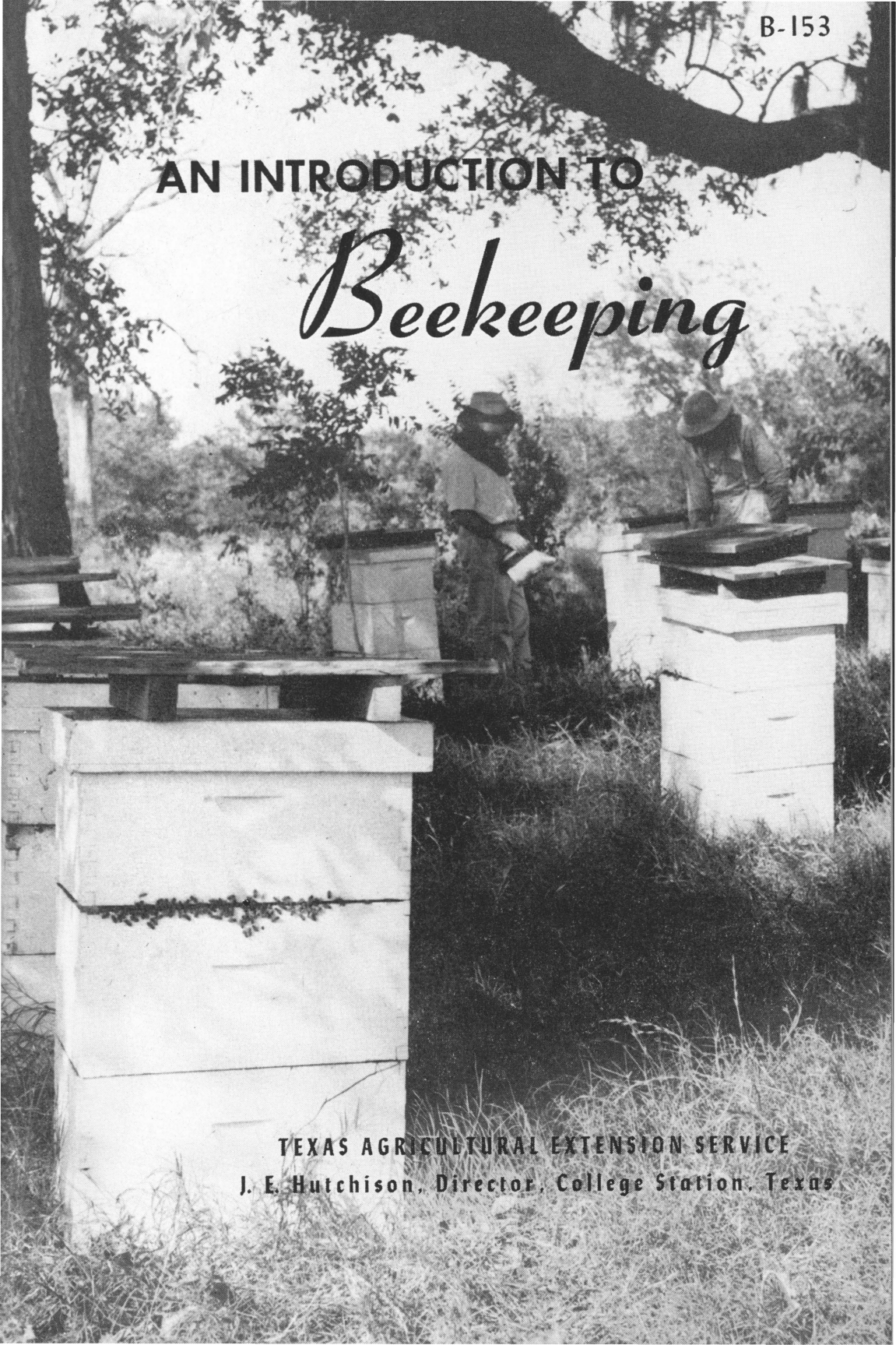
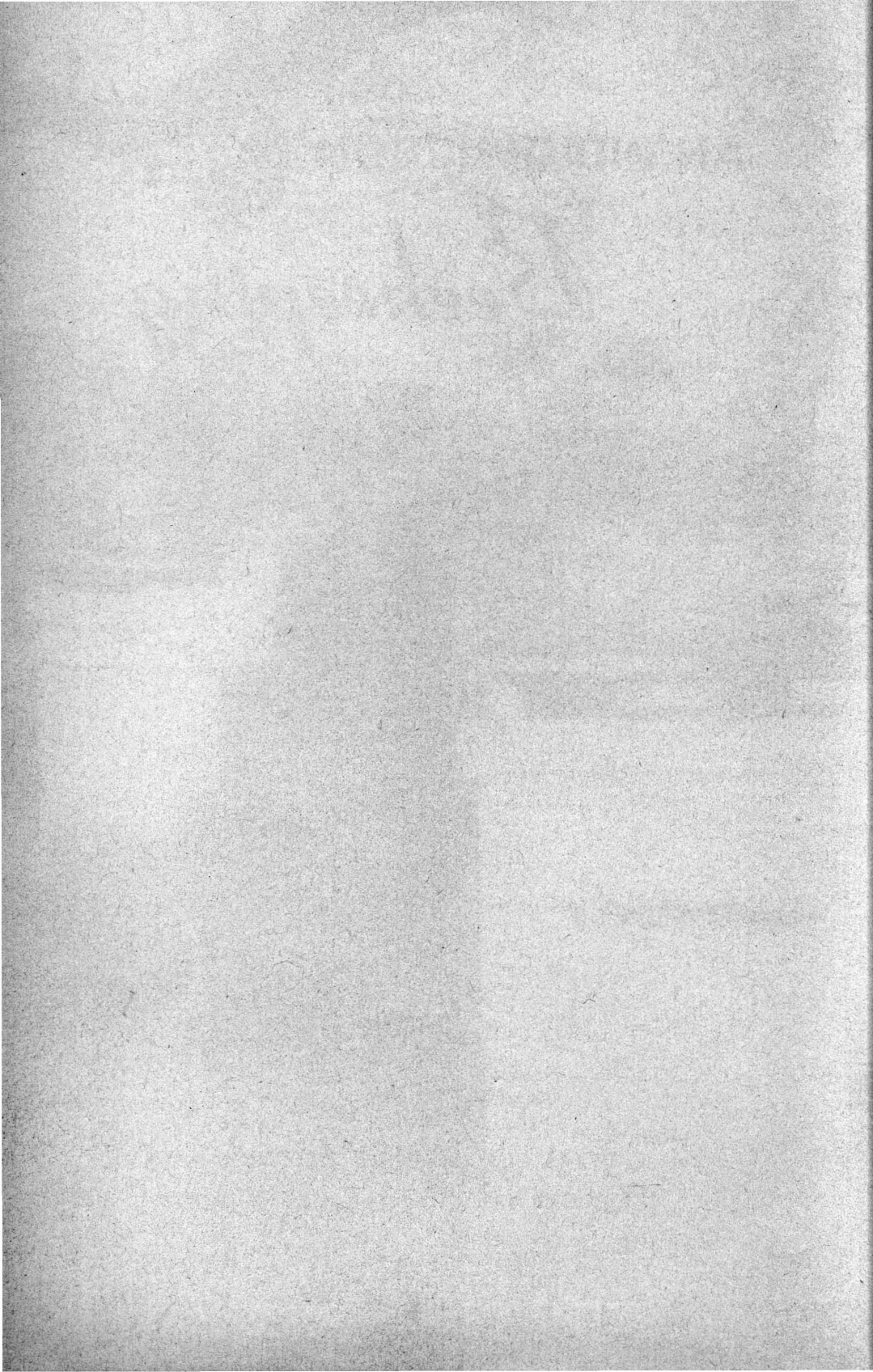


AN INTRODUCTION TO

Beekeeping



TEXAS AGRICULTURAL EXTENSION SERVICE
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An Introduction to Beekeeping

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THIS BULLETIN is written for the enthusiast who is just beginning to learn about the mysteries of honeybee behavior. Questions received from beginning beekeepers throughout the State have been the basis for selecting and stressing certain phases of bee culture.

How to Become a Beekeeper

Many people become beekeepers by chance. Often it begins with finding a stray swarm of bees hanging on a bush or a tree. No potential beekeeper is going to let this swarm leave without attempting to hive it or put it in suitable living quarters. The finder of such a swarm makes a quick search for bee equipment and information on how to handle a swarm of bees.

Equipment Needed

There are many items of bee equipment which might be interesting to have and which can be used occasionally. However, the following list includes the necessary items which the beekeeper needs from the beginning.

¹State Entomologist, Texas Agricultural Experiment Station.

- Bee smoker (Fig. 1)
- Bee veil or mask to protect face and neck
- Hive tool—to pry frames apart
- Bee gloves—to protect hands and arms
- Complete bee hive which includes:
 - Bottom board
 - Hive body
 - Removable frames with foundation
 - Super with frames (Fig. 3)
 - Cover or lid
 - Feeder pail

Fig. 1. Equipment needed includes a bee smoker in left hand, hive tool in right hand. Note the elbow length, ventilated bee gloves, and the folding wire screen bee veil that fits over hat. In the foreground is a frame of foundation that has been removed from the 10-frame hive body.



The beginner may wish to purchase a drone and queen trap, which is shown in position on front of the hive in Fig. 3., or a queen excluder, also shown in Fig. 3, but these usually are not essential.

Additional supers may be needed later. At least three extracting supers for each colony may be needed in good locations. Other items which aid in manipulating bees or removing the honey crop include an uncapping knife, bee brush, honey extractor, honey tank and wax rendering equipment (Fig. 2).

How to Obtain Bees and Equipment

A beehive may be purchased from another beekeeper, a swarm may be caught, a bee tree cut, or a package of bees with queen may be bought from a reliable bee shipper to make the start. With all of these methods, except purchasing a complete

Fig. 2. Extracting equipment. Note the uncapping knife in right hand in position to start cutting the cappings off the honeycomb. When both sides of the comb are uncapped, it is placed in the extractor in the right foreground and whirled to remove the honey from the comb by centrifugal force.

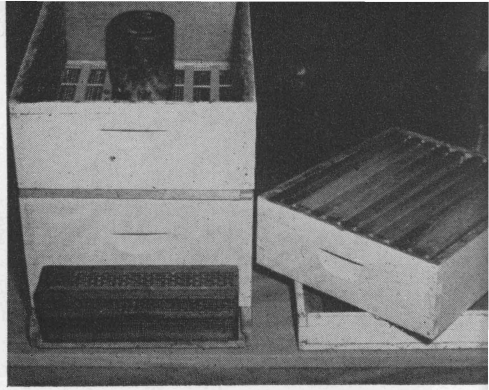


Fig. 3. The shallow super with frames is resting diagonally on upturned lid or cover. The queen and drone trap are in place at the entrance of the hive in the left foreground. The deep hive body, queen excluder, empty shallow super with a bucket feeder inverted over the queen excluder are in that order over a bottom board on the left.

beehive, the equipment must be assembled ahead of time, painted, and full sheets of foundation put into the brood frames. A swarm or a package of bees should be fed if installed in a hive with full sheets of foundation.

Catching the Swarm

If the swarm of bees is clustered on a low branch of a tree or shrub, it is easy to shake it into or in front of an empty hive. The bees usually run into the hive and begin housekeeping when this is done. Some beekeepers prefer taking the cover off the hive and gently shaking the bees into the hive before replacing the cover. After the swarm has entered the hive and appears settled, the hive may be moved to its permanent location.

How to Install Package Bees

Bees are shipped in cages such as shown in Fig. 4. The

feeder can is shown in place and the queen cage is suspended inside by means of a fine wire.

If a package of bees with the queen is ordered, the equipment should be assembled and placed on the permanent locations before the bees arrive. Before transferring the bees to the hive, they should be fed warm sugar syrup, which is made with one part sugar to two parts warm water. This can be fed by sprinkling the syrup on the cage until the bees will take no more syrup.

Another common practice is to install package bees in

hives late in the afternoon after wetting the bees with warm water and removing the paper from the candy end of the queen cage. The top is removed from the package, the feeder can is taken out, about half of the frames are removed and the wet bees are shaken into the space where the frames were removed (Fig. 5). Then the frames are carefully replaced, the queen cage with candy end exposed is inserted between two frames. Some arrangements for feeding should be made when the packaged bees are installed on foundation.

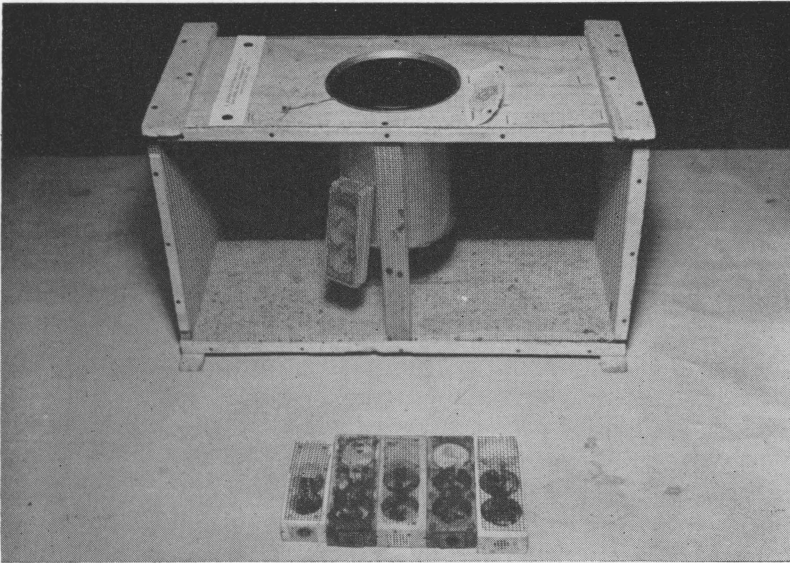


Fig. 4. The shipping cage includes an empty feeder can and queen cage suspended by a small wire inside the bee shipping cage. When ordering a 2 or 3-pound package with queen, they will arrive in this type container. In the foreground are queen cages showing the candy food supply at the far end of the cage and the queen and escort worker bees in the front two-thirds of the cage.

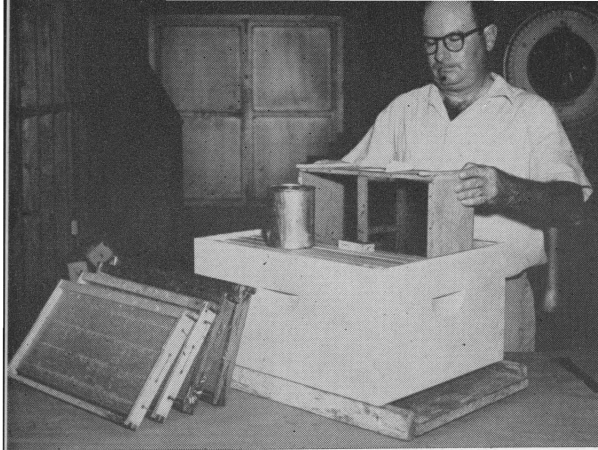


Fig. 5. Installing a package of bees. The bees are shaken into the empty space where four frames have been removed. The feeder can and queen cage are resting on the frames remaining in the hives.

How to Feed Bees

A satisfactory method of feeding bees is to fill a friction-top 5-pound pail with sugar solution, Fig. 6. Punch a few holes in the tight-fitting lid and invert this over the frames of the brood nest, Fig. 7.

Then add an empty super and put the lid on the hive. The bees will take this syrup out through small holes in the friction-top can and store it in the comb as they build cells. Entrance feeders, inside division board feeders and other special made feeders can be purchased, but the friction-top pail is adequate for the beginner.

Selection of Apiary Site

The beginner usually will keep his bees at or near his home, but certain points should be considered in selecting a location. Trouble will be avoided later if the bees

are located in an isolated spot where people and animals do not have to cross the line of bee flight. If they are located in town, they should be placed in a fenced enclosure where a hedge or other obstruction forces the bees to fly high enough to avoid traffic and pedestrians. If there is a choice, a southern slope with good air and water drainage is preferred. Partial shade is best, but if no trees are available, a board can be used. Avoid dense shade.

Probably the most important factor in locating bees is the nearness of honey plants. It will be unprofitable to keep bees in a vicinity where no nectar-producing plants are grown. A trial in one location may convince the owner that a new location is needed.

Honey Plants

In all parts of Texas there are some plants which produce nectar. The bees should be located where a succession of honey plants will provide a build-up followed by a surplus honey flow. This enables bees to store some honey for the beekeeper plus an ample supply for themselves until the next surplus honey flow.

The more important cultivated honey plants of Texas are Hubam clover, Madrid clover, hairy vetch, cotton, whiteclover, citrus and alfalfa.

Among the native plants and shrubs which produce

nectar are guajillo, catsclaw, mesquite, rattan vines, horsemint, marigold, basswood, honeylocust, aster, goldenrod, white brush and willow. When climatic and soil conditions are favorable, they secrete nectar, but in most seasons they may not produce enough nectar. Each locality differs in the amount and kind of nectar-secreting plants.

The Colony

Each group of bees with one queen in a suitable bee box is called a **colony**. A group of colonies, or hives as they are sometimes called, is known as an **apiary**. In every colony will be found three distinct kinds of bees, the **queen**, the **drones** and the **workers**. The queen can be recognized by a longer, tapering abdomen, being broader and thicker than the worker, but not as broad as the drone. She is an important member of the colony because of her egg laying ability. The term, "queen," does not indicate

regal authority because she may be more of a slave than a ruler. She is the mother of both drone and worker bees.

Developmental Stages of the Honey Bee

The workers, queen and drones all go through the same developmental stages. They hatch from an egg which has been deposited in an empty cell in the honeycomb. In about 3 days the egg hatches into a small crescent-shaped, worm-like stage called a larva. This small organism grows rapidly. Like other insects during their growing stage, the honeybee larva sheds its skin. The larva sheds its skin or "moults" five times before becoming a pupa or resting stage. The pupa "moults" once just before it chews its way through the capping of the cell in the comb and emerges as an adult bee. The interval between the laying of the egg and the emerging of the adult bee is 21 days for the worker, 16

Fig. 6. A friction-top 5-pound pail with holes in the lid which contains a sugar solution.



Fig. 7. Friction-type pail inverted over the frames of the brood nest.



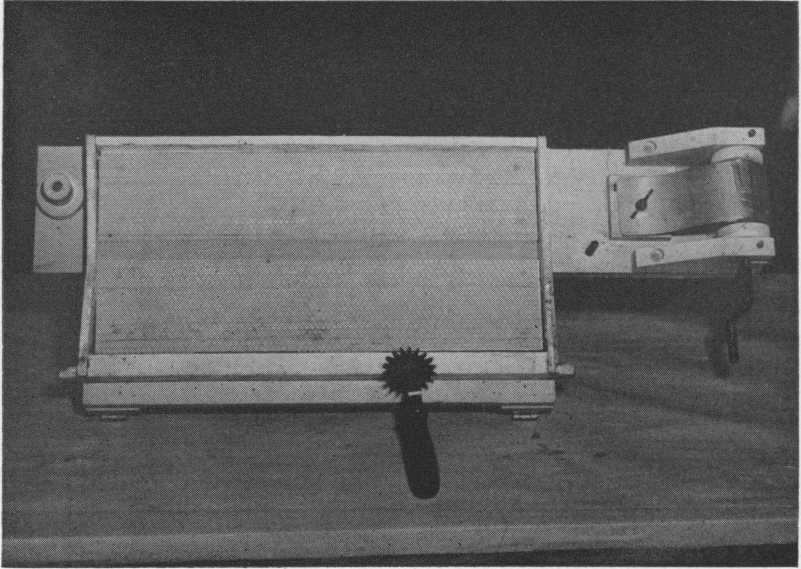


Fig. 8. A combination frame wiring board and embedding board with spur wire embedder in the foreground. Usually four horizontal wires are threaded through the holes which come in at each end bar, and tightened. A wrap of wire is made around a carpet tack which is driven into the wood to keep wires taut. A full sheet of wax foundation is placed underneath the wire and the wire is pressed into the wax with the spur embedder.

days for the queen and 24 days for the drone bee.

Both queens and workers are females. They hatch from a fertilized egg, but the difference in the two castes seems to depend on the quantity of essential food nutrients consumed by the queen and worker larvae. Essentially the same kind of food is given the larvae of the two castes for at least 2 days. This food is known as royal jelly and is a glandular secretion which originates in the head of a worker bee. On the third day there is a change in the food provided the worker

larvae. The quantity of food is reduced and pollen and honey are included in the diet. The queen larvae are fed large amounts of royal jelly. The reproductive organs are fully developed in the queen and she may become the egg-laying machine that is her role in the normal colony. The glands in the head of a worker bee which furnish food to the young larvae are developed in the worker bee, but they are not present in the queen. These two kinds of females are necessary to perform the duties of both laying eggs and feeding the young

bees to maintain the population of the colony.

The drone is the male bee and performs no regular duties except that of mating with the virgin queen. This occurs in the air and seldom is witnessed by the beekeeper. The mating flight occurs about a week after the young queen emerges and each queen may fly out to mate more than once. The drone mates only once and dies. Many drones may be in a hive during the spring, but when the secretion of nectar has ceased and the honey flow appears to be over, the drones are ejected from the hive and left to starve at the entrance.

Examining a Hive of Bees

Since this publication is written for beginners, it is advisable to explain steps in examining a colony of bees in the hive.

The most important piece of equipment needed to manipulate bees is a bee smoker. Figures 9, 10 and 11 illustrate its proper use.

If there are holes or other openings in the hive, it is im-

Fig. 9. Smoker being fired up for smoking bees.

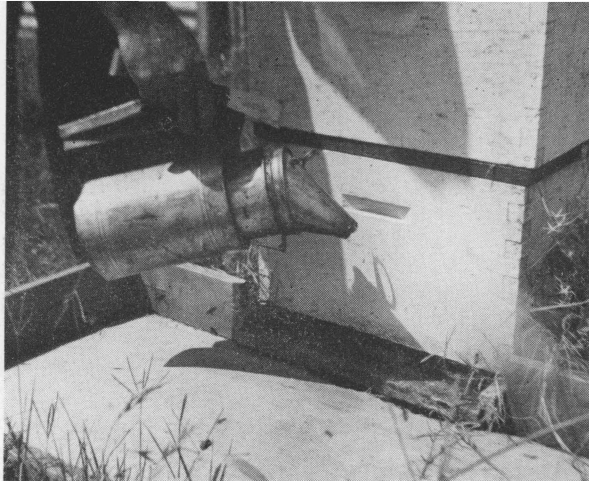


Fig. 10. Smoking the entrance to the hive.

portant to direct a puff of smoke at them. Experience teaches the operator how much smoke is necessary.

The next problem is to take out a frame to get some working room. A hive tool or some kind of tool is needed to pry the frames apart. Figures 12, 13 and 14 illustrate steps in removing a frame.

Once removed, the frames should be leaned against the side of the hive near the entrance. Now, additional frames can be examined and replaced in the hive. Careful handling of the brood frames is important so that the queen will not be crushed or dropped

Fig. 11. Smoking the top of the hive as soon as the cover is raised.



outside the hive. Do not take a frame out of the middle of the brood nest because there is danger of injuring the queen. Remove one of the frames near the side of the hive first.

Management Practices

Contrary to popular belief, bees cannot be placed on a location where they will do all the work and honey will be waiting in the supers for the beekeeper to remove. Certain hazards are involved and certain practices are necessary to get the most out of bees.

Swarming. In nature, bees increase the number of colonies by swarming. During the spring when the colony becomes overcrowded, the weather is warm, and nectar is available, the swarming impulse is manifested and the colony readies itself for this important event. A number of queen cells are started, work slackens and scout bees search for a new habitation. When the queen cells are capped, the swarm accompanied by the old queen, comes from the hive and clusters on some nearby limb. After a lapse of 15 minutes to a day, or more, the cluster is broken and the bees fly away to establish a new colony.

Beekeepers do not like swarming because the swarming impulse often occurs just as the main honey flow begins. With a divided force, little surplus honey will be stored. Bees must be at peak strength to store the greatest



Fig. 12. Prying the frames apart with a hive tool.

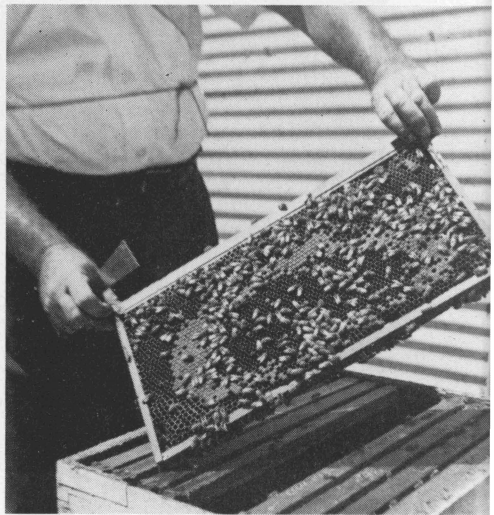
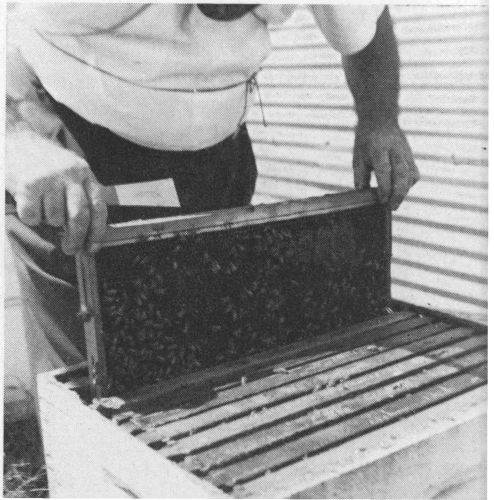


Fig. 13. Removing the first frame from the hive.

Fig. 14. Final removal of first frame from the hive.



honey crop. If more colonies are desired, the beekeeper may easily make his increase at a more appropriate time.

The most important factor in swarming is congestion of the brood nest. Adequate room in the form of hive bodies or supers should be added in the spring as the colony increases in numbers. Frames of brood should be placed in the super above and frames of empty combs or foundation substituted, thus scattering the brood and preventing congestion. Since bees usually swarm with old queens, requeening aids in reducing swarming.

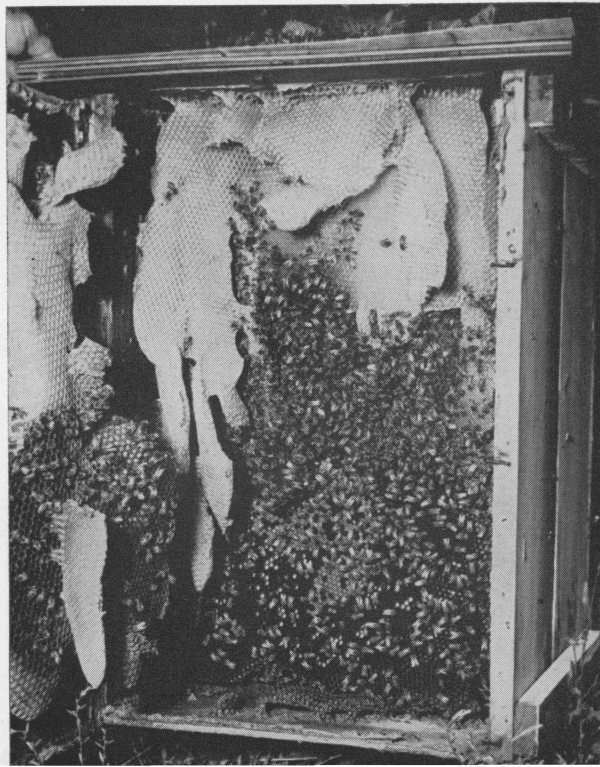
How to Divide a Colony. A division can be made to prevent swarming. This usually is done when the beekeeper prefers to sacrifice surplus honey in order to increase the number of colonies. It also may be done in an apiary when the peak of brood rearing occurs some time before the main honey flow starts. Both divisions may have sufficient time to increase in population to surplus honey gathering strength.

To make the division, provide an empty hive body with its full complement of frames with foundation or empty combs. Place hive in its permanent position a few feet to one side of the old hive. From the old hive, remove half of the frames containing brood and put them into the new hive, exchanging them for empty frames. In doing so, try to divide the honey stores

and the sealed developing brood about equally between the two divisions, making sure there are some eggs in each division. If the queen can be found, she should be placed in the new division on the new location. If the queen cannot be seen, the fact that eggs are present in both divisions will enable the queenless division to rear another queen.

If a queen is purchased and available at the time of making the division, the queenless portion may be requeened as explained in the paragraph, "How to Introduce a Queen." Directions for introducing a

Fig. 15. A box hive opened to show the irregular formation of comb when bees do not have straight frames with full sheets of foundation supplied them. It is illegal to keep bees in this manner in Texas and in most other states.



queen also accompany the mailing cage.

When Should a Hive Be Re-queened? The beginner should learn to examine the brood combs frequently to see if the queen is still doing good work. The open cells should be examined for eggs and the position of the eggs ascertained. A good queen will lay in a solid pattern without leaving many unused cells. Eggs from a good queen are placed in the bottom of each cell and attached on one end by a glue-like substance. If the eggs are dropped on the side of the cell wall and there is more than one egg in a cell, it is possible that the queen has failed and the condition known as "laying workers" has developed. Sometimes when a queen gets old she ceases to be fertile and all or part of her eggs hatch into drones. This queen should be killed and a new queen introduced.

How to Introduce a New Queen. The beginner should order the replacement queen when he sees the old queen is failing. When the new queen arrives, the old queen should be found and destroyed. The pasteboard strip covering the candy end of the cage in which the new queen arrived should be removed to expose the candy. The cage with queen and escort bees may be inserted between two frames near the brood.

Arrangement of Combs. While examining the combs

of the brood nest, the drone comb (combs with large cells in which drone bees are reared) and the combs with odd-shaped or stretched worker cells should be moved to the wall or outside the brood nest. These combs will be filled with honey and pollen and the perfect combs with worker cells should be arranged together in the center of the hive to form the brood nest. Discard the combs which do not have nearly all worker cells and render them for wax, which is an important product of bees. All bits of comb and beeswax should be saved and rendered into wax cakes to be sold.

Robber Bees. The beginner should learn to recognize the activity of robber bees, the cause of robbing and its control. When bees are not busy gathering nectar, the exposure of honey or honeycombs will cause them to become excited and start them to steal from each other. A colony which is too weak to defend itself may be robbed completely. Robber bees chew the combs in their effort to get the honey, and fights occur between the defending bee force and the attackers. Robbers are recognized by the noise they make and their rapid, dancing flight as they dart toward the opening of the hive attempting to find an unguarded entrance.

To prevent robbing, the beekeeper should not open his hives and expose honeycombs



Fig. 16. An apiary showing good arrangement. Note the distance between hives is sufficient to work from the side. Less drifting of the field bees occurs when bees are at least this far apart.

during a scarcity of nectar, except for short periods. At the first sign of robber bees at work, reduce the entrances of the hives and use a repellent around the cracks where robber bees attempt to gain entrance to the honey. Kerosene, gasoline and carbolic acid solutions are good bee repellents. A cloth moistened with a carbolic acid-water solution is used to cover combs and honey which bees are attempting to rob. If the bees need to be fed during a critical period, it should be done at night or late evening.

Bee Stings. The honeybee stings for the protection of the colony. When away from the colony, it will not sting unless provoked. It is more

apt to sting during cool, cloudy days when it is unable to fly and gather nectar. Bees dislike sudden movements, dark colors, woolen clothing and pungent hair oil.

A bee veil and bee gloves will prevent many stings. Proper use of smoke is important in reducing the number of bee stings. Before removing the cover from a hive, a puff of smoke should be directed into the entrance. Avoid jarring the hive before smoking the entrance. As soon as the cover is raised, a puff of smoke should be blown under the cover. As each super is removed, additional smoke should be blown across the tops of the frames. Experience will teach the begin-

ner how much smoke to use and when to use it most effectively. Usually one sting causes other bees to sting, because the odor of the sting excites them.

When the bee stinger is inserted into the skin, the bee cannot remove it, but pulls away leaving the stinger with a small poison sack attached in the skin of its victim. Beginners are cautioned not to grasp the stinger between the thumb and forefinger to remove it, since this causes more poison to enter the skin. The stinger should be scraped out of the skin with the thumb nail or a knife blade.

Wintering Bees. Texas climate enables beekeepers to winter their bees out-of-doors without any additional pack-

Fig. 17. A factory-made, dove-tailed bee hive with queen excluder between shallow super and deep hive body. On top is a telescoping cover.



Fig. 18. An example of poorly fitting bee equipment. The lower hive body is a homemade odd size that will not fit the 8-frame super above and will be too small for a 10-frame super.

ing or insulation around the hive. The entrances should be reduced in size and the hive faced toward the south. The beekeeper should see that there are adequate stores in the hive. A single story (one hive body with top and bottom) should weigh about 50 pounds to insure adequate stores for winter. During the dormant winter period very little honey will be consumed unless the weather is warm and the bees are flying frequently. When spring brood rearing begins, the consumption of honey increases rapidly and during this critical period the bees may need to be fed.



How to Render Beeswax

With only a few pounds of beeswax to render each year, it would not be profitable to invest in a wax press or other expensive wax rendering equipment. The beginner can render wax in a large tub or pot. The bits of wax and comb material should be put into the tub or pot and covered with water. The pail should be on a sturdy fire-proof stand so a fire can be built underneath. Heat the water to boiling. The wax will be liberated from the comb material and rise to the top of the hot water. Be careful not to allow the water to boil over, since this hot wax will burn.

After the wax boils for about 30 minutes, remove the melted wax with a long-hand-

Fig. 19. Waxworm damage to combs. The box hive in the picture died of starvation and the waxworms are tunneling through the unprotected combs.

led dipper and strain it through a screen wire strainer to remove large particles of foreign material. If it is strained into a small pail which is larger at the top than at the bottom, the wax cake can be removed easily after it cools and hardens. Since wax is lighter than other material in this cooking mixture, the pure wax will be on top and at the bottom of the wax cake will be some debris which can be removed by trimming and scraping. This wax will be purchased by bee supply houses.

A solar wax-extractor, excellent for a small beekeeper, is an oblong box with a glass top. Inside it is a metal sheet on which the combs are placed. It is set facing the south so that the sun will melt the wax and cause it to run into a pan.

The Wax Moth

Many beginners blame the waxworm or webworm, the immature stage of the wax moth, for their inability to keep bees. Actually the waxworm is a scavenger and eats and webs the combs after the colonies become weakened from other causes (Fig. 19). The presence of waxworms destroying combs indicates difficulty in the colony and the beekeeper should look for the cause of the trouble. Queenlessness, starvation, disease, insecticidal and plant poisons, and poor stock may be suspected and should be



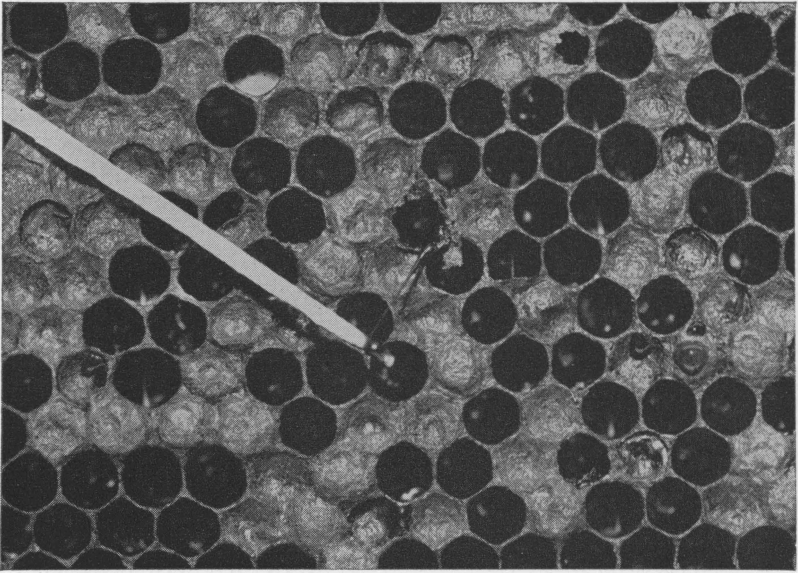


Fig. 20. Enlargement of a section of comb showing American Foulbrood. Note the "ropy" material suspended between the toothpick and the diseased cell. The tongue of a diseased pupa is visible two cells to the right of the roped-out cell. Dark sunken cappings and cappings with jagged holes in them are visible in several portions of this comb.

investigated. A vigorous stock of healthy bees will keep the waxworms pulled out of the hive as fast as they appear.

Waxworms destroy stored combs or comb honey. If honey in the comb is removed from the hive and stored for any length of time during warm weather, some method of protecting it from waxworm damage must be devised. Supers of empty combs which have been removed from the beehive will be attacked by waxworms if not fumigated.

Fumigation of stored combs by certain insecticides is the

best method to prevent damage by waxworms. Carbon disulfide, paradichlorobenzene, calcium cyanide, methyl bromide, and chlorosol are good fumigants to control waxworms in stored combs.

Because of the danger to human health when the fumes from these insecticides are breathed, the recommended drug for the beginner is paradichlorobenzene. "PDB" is a white crystalline substance which changes slowly into a gas. The gas is nonflammable, nonexplosive, and not injurious to people at the concentration obtained when used as recommended. It kills

the adults and larvae of the waxworm, but is not effective against the eggs.

A stack of supers may be fumigated by sealing the cracks with strips of gummed paper, placing 3 or 4 tablespoons of "PDB" crystals on top of the frames of the top super and putting the cover tightly in place. At intervals during the storage season the cover should be raised and more crystals of "PDB" added as needed. Since some repellent action is obtained from "PDB," the moths are not likely to enter the stack of treated supers as long as fumes of the insecticide are present.

Bee Diseases

There are disease hazards in beekeeping. Four recognized diseases of the brood of bees and several adult bee diseases occur in Texas. The brood diseases appear to be more serious and destructive to the honeybee colonies. The most serious disease in Texas is *American Foulbrood*, which is caused by bacteria. These bacteria do not affect the health of human beings, animals, or even adult honeybees. Those immature stages that are affected by the organism causing this disease die late in the larval or early pupal stages, turn brown in color, and become "ropy" or sticky in consistency.

The enlargement, Fig. 20, shows how a larva or pupa

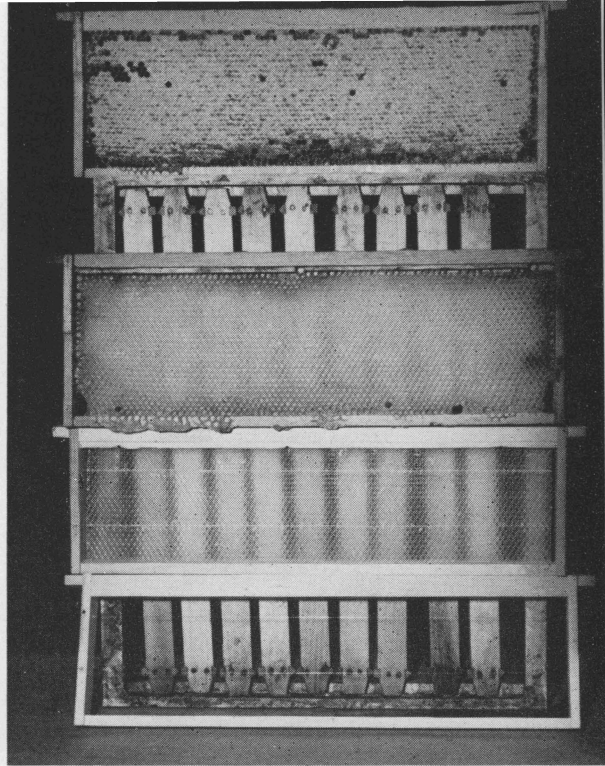


Fig. 21. A super with nine frames showing successive stages in the preparation of an extracting frame as a background. At the bottom is an empty frame with two horizontal wires. The second frame from the bottom shows a sheet of wax foundation in place in the frame and the wires are embedded. In the third frame the bees have built honeycomb, and the top frame shows the honeycomb filled with honey and capped. This frame is ready to be uncapped by the beekeeper and extracted.

"strings out" when a toothpick is inserted into the slimy mass and withdrawn. The "string" may not break when drawn out for an inch or more. The decayed larvae or pupae dry to scales which adhere tightly to the lower side of the cell in which death occurred.

The general appearance of the honeycomb in which

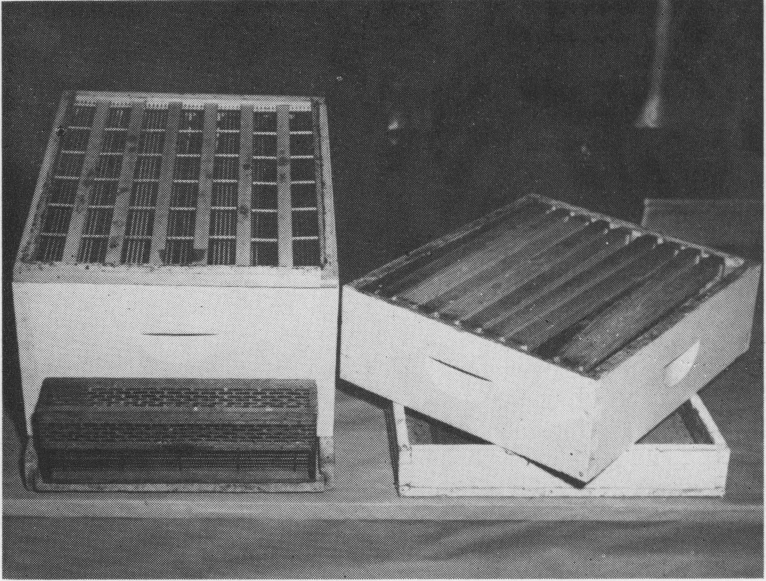


Fig. 22. The shallow super has been removed from the hive and placed on the hive cover to show the wood and wire queen excluder in place. The queen and drone trap on the front is optional equipment and of questionable value in most instances.

young bees are reared is an aid in determining the presence of American Foulbrood. The diseased brood in the comb causes the cappings to turn darker and more "greasy-looking" than the cappings over normal, healthy brood. The cappings over diseased cells frequently sink inward and small irregular holes appear in these sunken cappings. These small holes may be enlarged by the adult nurse bees until the entire capping over the diseased cell is removed and the contents of the cell become visible. When a pupa forms a scale, the tongue of the young bee can be seen pointing upward

and backward from the head of the dried scale.

A colony of bees affected with American Foulbrood is said to have a distinctive "gluepot" odor. This is true especially of an advanced case. Since there are many other similar odors around an apiary, the odor alone cannot be relied upon in diagnosing the disease.

American Foulbrood spreads slowly in a beehive. More and more of the brood becomes affected and the colony gets weaker and dies out completely. Then other bees within flying range enter the hive in search of food and

carry the honey, which is contaminated with bacteria, back to their home hive. When this diseased honey is fed to young larvae of susceptible age, they die and a new infection occurs.

Laws Affecting Honey Bees

Because of the infectious nature of this disease, most states have laws regulating the keeping of bees. Administration of the law was

placed with the State Entomologist, Department of Entomology, College Station, Texas. Samples of brood comb suspected of infection with American Foulbrood may be sent to this address for identification. The movement of bees across county lines must be accompanied by a certificate or permit from the office of the State Entomologist. Other information may be obtained from your county agricultural agent.

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A number of state beekeepers' associations furnish monthly news notes to their members. Payment of membership dues in the Texas Beekeepers Association entitles each member to receive a monthly newsletter.

*These books may be obtained from public libraries, book dealers or bee supply firms.