SECTION 6 – IMPROVED HIVES

The purpose here is not to set out one hive as the single answer to all the aspirations of the potential beekeeper but rather to take an unbiased look at the different improvements that have been tried. Thus, enabling the individual to make a reasoned choice on the type that best suits his or her needs, skills, location and materials available.

Improved hives and hive management

In some countries, and regions within countries, wood is very scarce. In such places it is often tempting to use wood which is unseasoned. The result is that the wood twists, warps and splits. This destroys the accuracy of fit required between boxes and frames with the result that the hive is at best inefficient at worse unmanageable.

FIG. 54. A modern box hive, complete with brood box and supers

There are some suitable tropical softwoods. Even these have to be seasoned which can take a year. They are strong, without being too heavy, as well as being reasonably easy to work. Another source of materials is timber which can be recycled. Plywood and blockwood from packing crates may offer cheaper alternatives. It is important that whatever is used, including any glue, has not been treated with pesticide or fungicide poisonous to bees.

Costs can be lowered if the life of the hive can be extended. So it is worth trying to prevent decay. This is caused by dampness penetrating the wood and the growth of fungi. Certain insects – like termites – can also be a problem.

The outside of the hive can be treated with preservative. Some preservatives are water repellent and others are fungicidal with the ability to deter termites and beetles as well. However, great care must be taken in selection so that the product used is (a) not noxious to bees and (b) does not leave odours which are repellent to bees. Creosote is one of the most readily available preservatives.

Once applied, the preservative must be left to be absorbed and to dry in a well-ventilated position. After this, the outside can be painted.

Painting should be done several days after the application of preservative. At least two coats should be applied to exposed parts. Light colours, particularly white, help to reflect the sun's rays and so keep the hive cool.

The most important way to preserve a hive is to ensure that it is kept off the damp ground on a hive stand or better still, suspended.

Do not dip the hive as this will be the same as painting the inside. The inside should be left in its natural state.

The hive consists of precision-made rectangular boxes which fit one on top of the other. This is why the upper boxes are called supers – because they are superimposed one on the other. The number of boxes varies according to requirements. Each box contains a set of framed combs. These hang in the box like files in an office filing cabinet. The rectangular frame is made with the top bar extending beyond the sides of the frame to create two lugs by which the frame is suspended from runners on each side of the box.

For any one type of hive the dimensions of the box depend on the dimensions of the frame and the number of brood frames it is required to hold. The width of any gap in the hive where bees move around between two facing surfaces must be equal to the bee space for the worker bees. The bee space for most African *Apis mellifera* is 7 mm (¼ inch).

The bees require this space between the sides of each frame and the walls of the hive, and between opposite surfaces of completed worker brood comb. It therefore dictates the distance at which the beekeeper spaces the combs. When one hive box is placed on top of another, a bee space is needed between the top of the frames in the lower box and the bottom of the frames in the upper box.

Following general rules, it is possible to build boxes. However, it is more practical to conform to existing patterns, particularly to that which is most common in the locality. In this way, advantage can be taken of help from neighbours and the interchange of equipment. Similarly, the possible communal operation of extracting equipment which accommodates a standard size of frame.

FIG. 55. A modern movable-frame hive with two supers in place.
1. The floor of the hive with a landing board and entrance.
2. Brood chamber – this is where the queen lays her eggs.
3. Frames – the beekeeper encourages the bees to develop the honeycomb on orderly frames by using foundation made of beeswax. This has the honeycomb pattern on which the bees will build.
4. Queen excluder – this is a mesh which is too small to allow a queen to pass but which allows the workers through easily. This means that only honey is stored in the combs above.
5. Super – this contains shallow frames which, when full of honey, can be removed so that the honey can be harvested.
6. Super – this is a second box which is needed when there is a lot of nectar and the bees are busy making honey. In a good season, even more supers can be added.
7. Roof – this keeps the bees dry. A crown board fits under the roof. This makes a bee-proof seal with the top box.

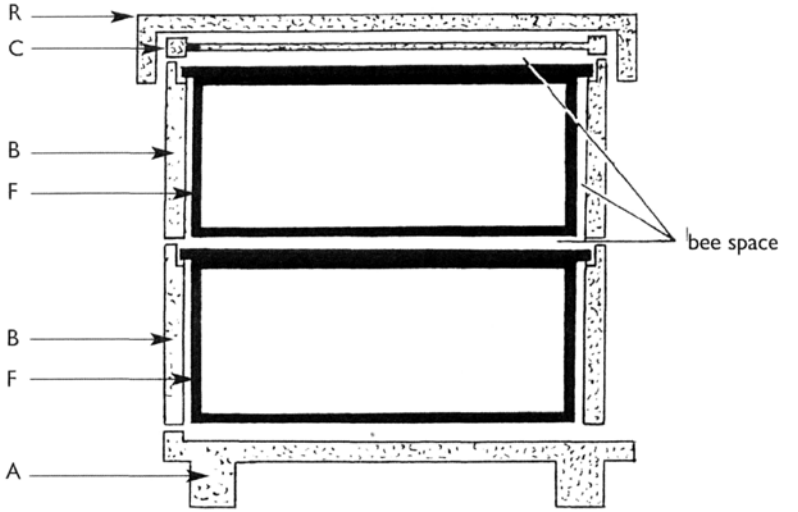

FIG. 56. The hive shown has a floor (A), two boxes (B), frames (F) a crown board (C) and a roof (R). It does not have a queen excluder which would normally go between the boxes. (After Walton, G M, Bee World *Vol 56, pp 109).*

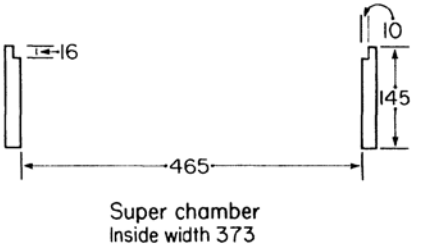

FIG. 57. Possible dimensions for a movable-frame hive. All measurements in millimetres. (After Voges, K, South African Bee Journal Vol. 55, pp 64–66, 1983).

Dimensions of even the same hive type can vary considerably from place to place. Whatever type of hive a beekeeper uses, all hive parts, frames and accessories (roof, inner cover, floor, excluder) must be compatible and conform to the same set of dimensions. For this reason, if the hives are being purchased, all parts should be bought in the same country, ideally from the same manufacturer. If the equipment is being built locally, the greatest care must be taken in the choice of materials and absolute accuracy and precision taken in the making of all the parts.

Frame measurements are critical:

	Length of top bar	**Length of bottom bar**	**Lugs on each side**	**Depth from top of top bar to bottom of bottom bar**
Brood (deep)	482 mm (19 in)	448 mm (17½ in)	17 mm (11/16 in)	233 mm (9³⁄₁₆ in)
Super (shallow)	482 mm (19 in)	448 mm (17½ in)	17 mm (11/16 in)	137 mm (5⅜ in)

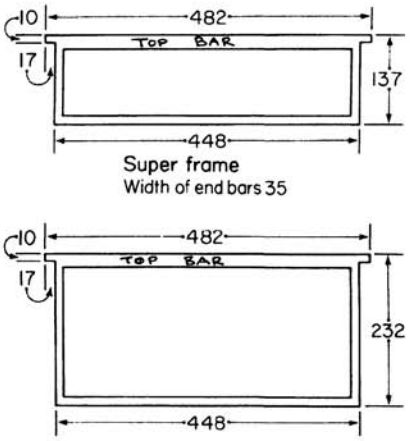

FIG. 58. Possible dimensions for frames. All measurements in millimetres. (After Voges, K, South African Bee Journal Vol. 55, pp 64–66, 1983). It is not necessary to have a four-sided frame. Such boxes can be perfectly satisfactory with just a top bar in place and worked like a top-bar hive. It is difficult to transport the hive if the combs are not in four-sided frames as they will break from top bars alone.

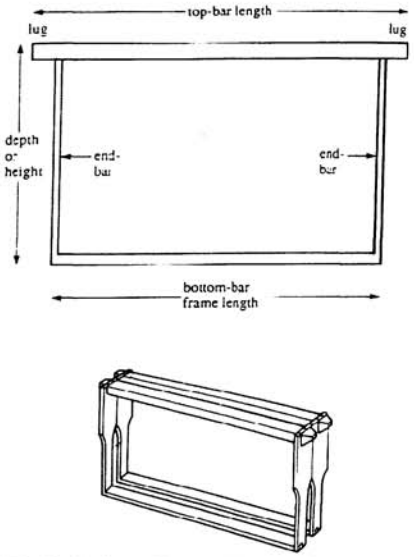

FIG. 59. Hoffman frames. Upper – Frame showing component parts. Lower – Two frames with Hoffman self-spacing end bars. The top bars have short lugs for a Langstroth hive.

The hive body consists of boxes which are open at both ends. There are two depth sizes but the length and width are the same for all boxes. The bottom box is the brood chamber (which has deep sides) and supers or 'shallows', because the sides are not so deep, fit above the brood chamber with the queen excluder in between.

Typical internal measurements in millimetres for these boxes as used in a South African Langstroth hive are:

	Length	Width	Height
Brood chamber	465 mm (18⅜ in)	373 mm (14¹¹⁄₁₆ in)	241 mm (9½ in)
Super	465 mm (18⅜ in)	373 mm (14¹¹⁄₁₆ in)	145 mm (5¹¹⁄₁₆ in)

The thickness of the timber for the walls should be approximately 20–22 mm (¹³⁄₁₆–⅞ inch). Queen excluders should be framed so that there is a gap of 4 mm (⅝ inch) above and below the surface to ensure the retention of the bee space.

The bars must be arranged in the hive so that the distance from the centre of one top bar to the centre of the next is 32 mm (1¼ inches).

A typical Langstroth hive built on these lines has 10 frames in the brood chamber and eight with slightly wider spacing in the super.

A Dadant box hive is very similar but usually bigger with at least 11 frames in the brood chamber and 10 in the super.

The top bar of the frame is designed so that the foundation can be secured to it while the bottom bar usually consists of two strips so that the foundation can be slid into place between them. End bars are straight, narrow pieces of wood, sometimes having a groove to help with the location of the foundation.

The comb-spacing or frame-spacing in a hive box is the distance between adjacent comb midribs or the foundation in the frame.

In the brood box, spacing should be the same as the centre-to-centre distance between adjacent worker brood comb in wild nests built by similar bees. The distance is equal to the thickness of the comb (the depth of two cells on adjacent sides) plus the bee space required by the adult bees to move between opposite comb faces. If the spacing is too narrow the bees cannot rear brood on both facing sides of the comb. If it is too wide then burr comb is built and this makes frames difficult to part and remove.

One way to maintain this space is for the top part of the end bar to be cut to this width so that when the frames are placed in contact they are the correct distance apart. Self-spacers of this type are often referred to as Hoffman frames.

The frames in the super, which have the honey storage combs, can be further apart. During a honey flow, bees increase the depth of the cells to hold more honey until only a bee space is left between the capped combs. Where perhaps 10 frames are used in a brood box it is customary to have nine or even eight frames in a super.

Hoffman frames are not suitable in supers as it is difficult to uncap the honey. It is more usual to have top and bottom bars with the same width (30 mm, 1¼ inch) so that an uncapping knife can slide down resting on them. The end bars should be 40 mm (1⅝ inch) wide, giving a closed frame.

The hive floorboard or bottom board is often made of planks of durable wood about 20 mm (13/16 inch) thick and the same dimensions as the brood box with the front protruding by about 50 mm (2 inches) to give a landing board. The upper side of the base has a rim about 20 mm (13/16 inch) high on three sides – the fourth side constitutes the entrance so this has a gap at least 8 mm (5/16 inch) high. An 18 mm (⅝ inch) gap or more enables workers to fan within the entrance. At higher temperatures it is important that they fan just outside the entrance. However, if the entrance is more than 50 mm (2 inches) high, it is likely to increase the temperature in the hive. The better ventilated the hive the less work falls on the bees and so more effort can be devoted to more productive activities. Good ventilation is also important in the ripening of honey.

As the floor is at greater risk of rotting, fungal decay or attack by termites, sometimes other materials are used. Framed aluminium or galvanized or stainless steel mesh is an expensive alternative. Such floors help to keep hives cool and can help in controlling varroa in those regions where bees are affected by this parasitic mite.

The use of concrete is increasing and this is a much cheaper alternative, although its weight does tend to make moving the hive difficult.

The top box on the hive will have an inner cover or crown board. This is normally a rigid piece of plywood the same dimensions as the box. Sometimes, a cloth cover or quilt is used, as the purpose is to enclose the bees in the box. The plywood covers sometimes have a slot (80 × 40 mm, 3⅛ x 1⅝ inches) in them which serves as a feed hole. The board has a rim around it to give the necessary bee space between the surface of the board and the top of the frames.

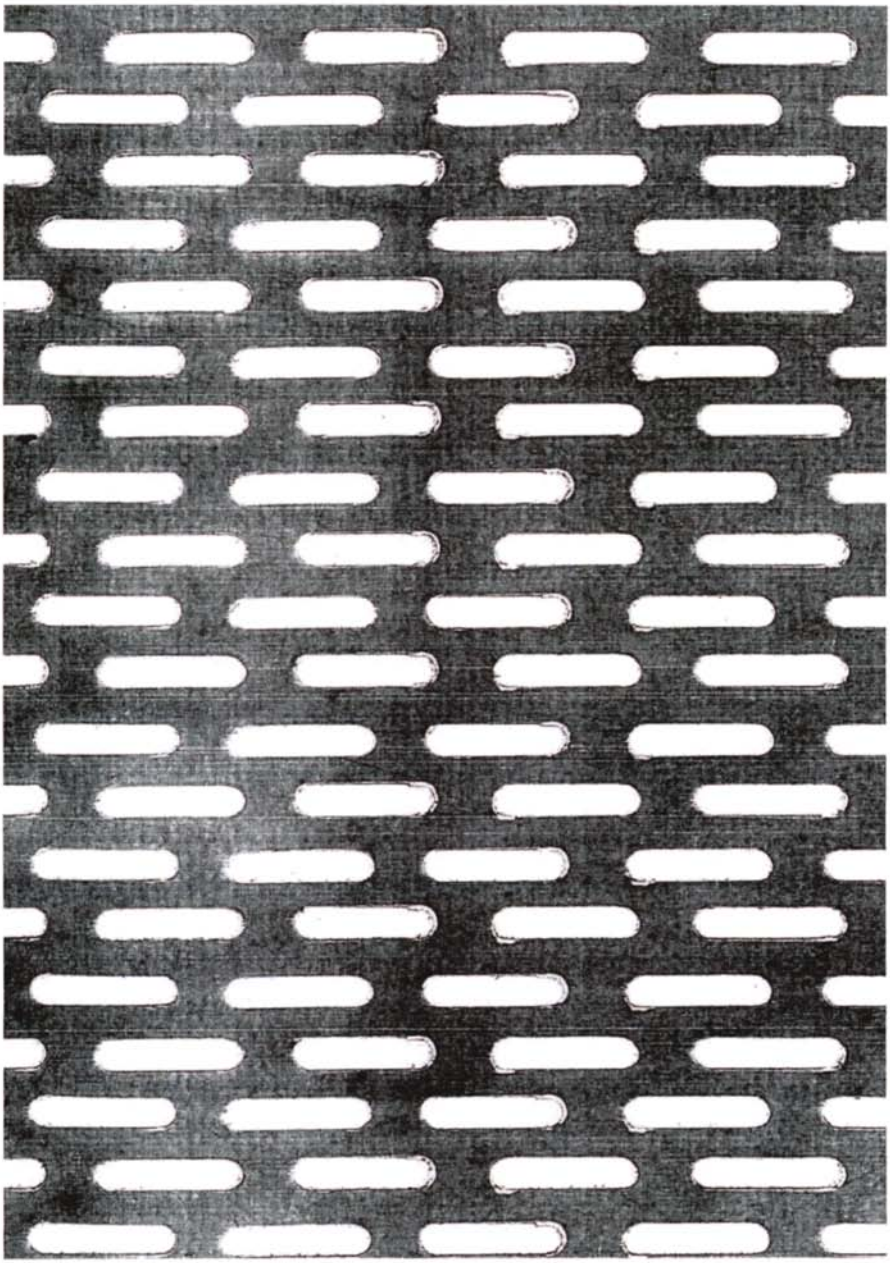

FIG. 60. Queen excluder (actual size). A sheet of thin metal with holes that allow worker bees to pass through but not the queen. This prevents the queen laying eggs in the super and so it becomes the honey store.

Usually a weather-resistant roof is placed over the inner cover. This can be a wooden frame which fits over the top box (telescopic) and is covered with metal to protect it from heavy rains. If the bee space is at the bottom of the box then it is satisfactory to use a flexible cover. Such a cover can be turned back little by little as the hive is opened. Also the propolis seal made by the bees can be broken more gently than with a rigid board. Suitable materials include jute sacking or canvas-type material not plastic sheet which prevents ventilation.

The last part of the hive is the queen excluder. This is a flat grid the same dimensions as the hive. The holes or slots are large enough to let a worker bee pass but prevent the queen getting through. It is placed in the hive above the box that the beekeeper wants as a brood nest so that no eggs can be laid in the boxes above which are the honey supers.

Sometimes, queen excluders need a frame or rim. This prevents the thin metal from sagging and also maintains the bee space above and below the frames. The correct size of slot depends on the queen's body size (about 4.4 mm, 3/16 inch).

Stands to support hives off the ground are not part of the hive. The simplest way is to raise the hive on concrete building blocks or bricks. More elaborate stands can be made from wood or concrete. These cost money but do help to keep the hives level, especially if the ground in the apiary is uneven. Even if the hive is only raised 100 or 200 mm (4 or 8 inches), the air flow is improved, helping to preserve the floor and improve ventilation in the hive.

The height, design and materials of the hive stand can vary with the ingenuity of the beekeeper. The main concern is that the hives are at a comfortable height to work and the materials used can be anything that is convenient – old railway sleepers (ties) – even the rails have been put to excellent use in the past. It is essential to discourage ants from climbing the stands and getting into the hives. Methods used with traditional hives can be used.

The movable-frame hive is complicated but brings some advantages to the beekeeper. These are:

- The comb is fixed within a frame facilitating and maximizing harvesting and

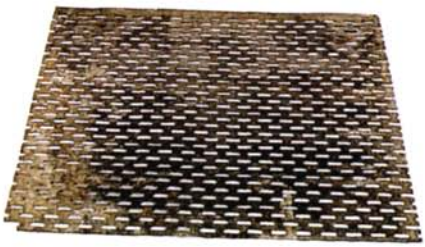

FIG. 61. This excluder has holes punched in a thin metal sheet that has the same dimensions as the brood box that fits below and the super that fits above.

FIG. 62. Another type of excluder uses thin metal rods that have been welded the exact distance apart that allows only workers to pass.

the added strength means less chance of damage to combs.

- The frame/comb strength allows the hive to be transported even on rough roads, and so the beekeepers can cash in on the pollination market or move bees to another area when forage is short.
- Easier to handle, fewer bees are crushed and so the colony is less antagonized.
- Supers contain just honey while brood is undisturbed in the lower box.
- Standardization of parts makes for much easier large-scale and commercial operation.
- Honey can be extracted by means of a centrifugal extractor and empty combs returned to the hive where they will be refilled. This maximizes the honey harvest.

There are some serious disadvantages. These are:

- Costly to buy from a supplier or even to buy the high quality timber necessary to make the hives.
- There are few, if any, local craftsmen who have the skill, equipment and precision to consistently make parts that fit exactly and are compatible with each other time after time after time. The description and dimensions given in this text have been simplified but they must be adhered to. Even if they are, the whole thing could be spoiled by the use of green timber (unseasoned timber). The writer has seen a wonderful row of Dadant hives, all brand new, yet it was impossible to remove the empty frames as the new timber from which frames and boxes had been constructed had warped and twisted. If there had been combs they would have become fixed combs and virtually useless, as they would not have been accessible without completely destroying the nest.
- The need to keep a supply of spare frames and supers for use at appropriate times is an expensive investment.
- Frames really need to have proper foundation, otherwise the bees are unguided in their construction and so the whole purpose of the frames is defeated. The making or buying of foundation is another expense and may be impossible to obtain in some areas.
- In order to capitalize on the frames, a centrifugal extractor is essential. This is difficult to make or has to be purchased from a commercial supplier. It is expensive and often requires hard currency as it is imported.
- The frames do not fit together as top bars do and so it is more difficult to control the bees.