Beehive Construction

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BEEHIVE CONSTRUCTION

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BEEHIVE CONSTRUCTION

Many beekeepers, beginner and experienced alike, anticipate manufacturing their own beehives. This is often done with a limited knowledge of construction requirements, and without proper tools. It is the intention of the writer to provide in the form of this circular a few hints and dimensioned plans to assist the builder in accurate and strong construction of beehive equipment.

In Canada the Langstroth movable frame hive has been adopted by the beekeeping industry. Such a hive provides for simplicity of construction and ease of manipulation by permitting rapid inspection and interchange of frames. Care in selecting lumber and accuracy in construction are essential to success. Well-constructed equipment pays off in ease of management, and the resale value is higher should the owner desire to sell his apiary.

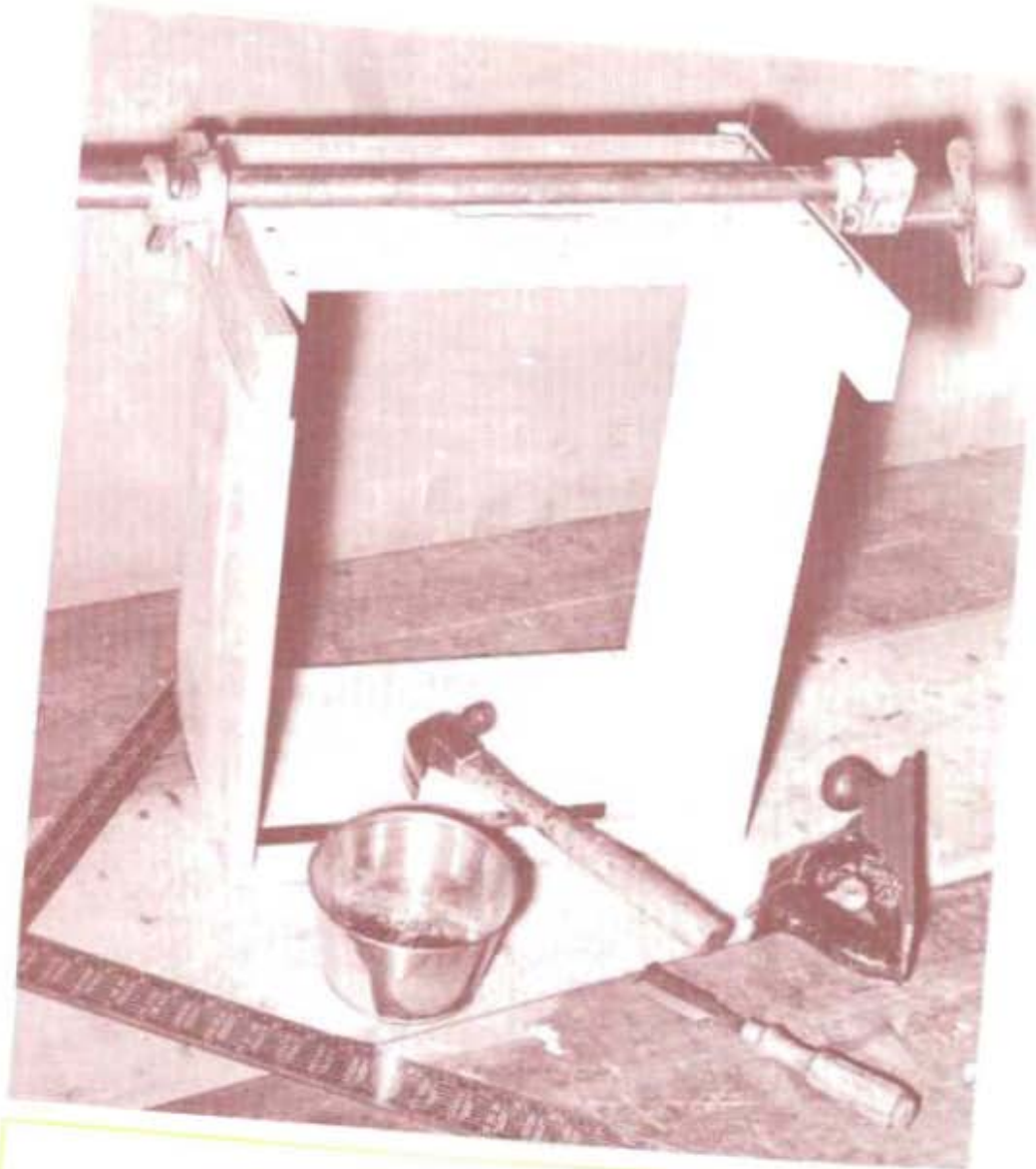
LUMBER

Pine or cedar is recommended for all construction, with the exception of top cover and floor of bottom board, in which case 13 mm ($\frac{1}{2}$ in.) plywood is preferable. Plywood is not affected by changes in temperature and moisture conditions to the same extent as shiplap or board lengths. Pieces used for construction of equipment should be flat. Small knots may be tolerated, provided they do not fall close to the edges or where handholds are to be cut.

Note — If lumber is not thoroughly dry, allowance must be made for shrinkage. The greatest shrinkage in lumber occurs across the grain, hence this is the only dimension for which excessive shrinkage should be allowed.

CUTTING OUT PIECES

Pieces must be cut absolutely accurate to the given dimensions. Handholds must be 16 mm ($\frac{5}{8}$ in.) deep — no more, no less.



BEE SPACE

Space provided for movement of bees within the hive, and particularly between combs, is a "bee space," and should be exactly 8 mm (5/16 in.). "Bee space" is the principle upon which all present day hive equipment is designed. It is therefore of the utmost importance that the hive dimensions contained herein be accurately followed.

ASSEMBLING

Nails

Box nails size 50 mm ($1\frac{1}{8}$ in.) are recommended for nailing supers, bottom boards and covers.

Supers

While various sequences of operation are possible, the following is recommended:

(1) Nail metal rests to end pieces, using 16 mm ($\frac{5}{8}$ in.) common nails (not tacks).
(2) Assemble, using clamp as in Fig. 5.
(3) Nail through top end into side pieces.
(4) Remove clamp, reverse super, clamp and nail other end.
(5) Remove clamp, check diagonals to assure that super is square.
(6) Complete by nailing through side piece into end pieces.

Note — The holding power of nails driven into end grain may be increased markedly by driving them in at an angle.

Metal Parts

These consist of rests for frames, and covers for hive tops, and should be made out of No. 28 gauge galvanized iron, aluminum, or other suitable metal. These items can be made up at any sheet metal shop.

ASSEMBLING AND WIRING FRAMES

While frame parts may be constructed, it is strongly recommended that frames be purchased from any reputable bee supply house.

As frames and comb represent the largest investment to the beekeeper, a few helpful hints on their construction would not be amiss.

Nailing

While there are many satisfactory ways for assembling and nailing frames, the one illustrated in Fig. 7 is recommended.

Care should be taken to see that only the special frame nails are used. It is very important to nail the frames so that they remain square. As a result they will hang properly in the super, thereby allowing the proper bee space all round. A

simple frame nailing device can be made at home or purchased from any bee supply manufacturer.

A good grade of waterproof glue may be used to fasten the parts of the frame together. A stronger frame will result. Other hive parts could also be glued before nailing.

Wiring

If frames are to be used for brood rearing or production of extracted honey, the following recommendations are made:

(1) Use vertically wired foundation.
(2) Use two horizontal wires of #28 gauge.
(3) In standard frames, at least two horizontal wires must be used. These wires should be located across the bottom holes and the third holes up from the bottom (see Fig. 9).
(4) Use eyelets (Fig. 9) where the wire runs with the grain to prevent cutting into the wood and consequent slackening of wire tension.
(5) Horizontal wires should be drawn taut and secured with 16 mm ($^5/_8$ in.) cigar box nails.

A device for holding the frame while it is being wired is desirable (Fig. 10). Such a device will soon repay any time or effort spent in designing and construction.

Waxing

Foundation should be placed in position and the cap strip (see Fig. 4) nailed in place with three to five 22 mm ($^7/_8$ in.) frame nails.

Embedding

Even though foundation may contain vertical wires, horizontal wires must be used to further strengthen the comb. These horizontal wires must be properly embedded. The most satisfactory way to embed wires in the foundation is to heat them by electricity until they are hot enough to sink halfway through the sheets of wax foundation.

The frame should be placed on the embedding board (Fig. 8) with the comb foundation beneath the wire. The electric current will heat the wires and a slight pressure by hand on each of the end bars will cause the wires to sink into the foundation. Contact with the wires should then be broken and the wires held in place until the melted wax congeals and fastens the wires securely in the foundation. The wires should

not be allowed to become too hot, or held in place for too long while hot or they will burn through the foundation. Wires should not be embedded when the foundation is cold; and frames containing foundation should not be stored in cold rooms, since contraction and later expansion of the wax will cause the foundation to pull loose from the wires.

PAINTING

Since hive bodies will spend most of the time outside and exposed to weather conditions, it is essential that they be painted. A good grade of outside white paint should be used. At least two coats of paint must be applied. The first coat should be thinned with turpentine in the proportion of one part turpentine to two parts paint. This will assure good penetration of the wood. It is desirable to paint both inner and outer surfaces.

STORAGE

Equipment, when not in use, must be stored in a dry and bee-tight building. If mice are present in the building, these must be trapped or poisoned with a commercial mouse poison.

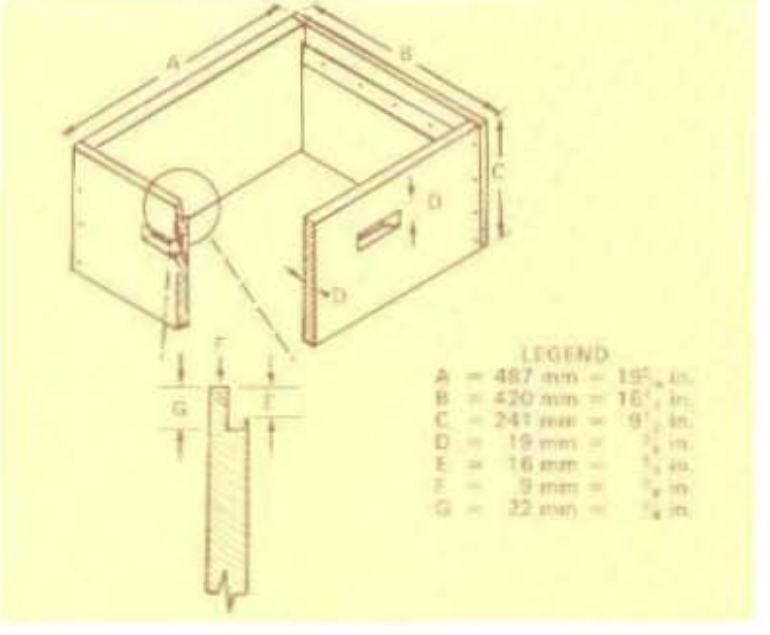


Fig. 1 Standard Langstroth super

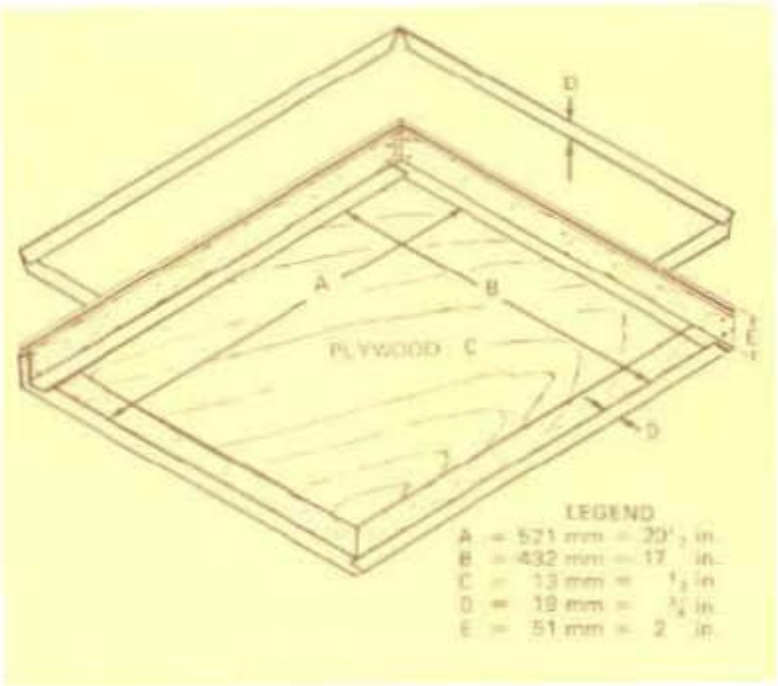


Fig. 2. Hive cover for standard Langstroth hive, viewed from below.

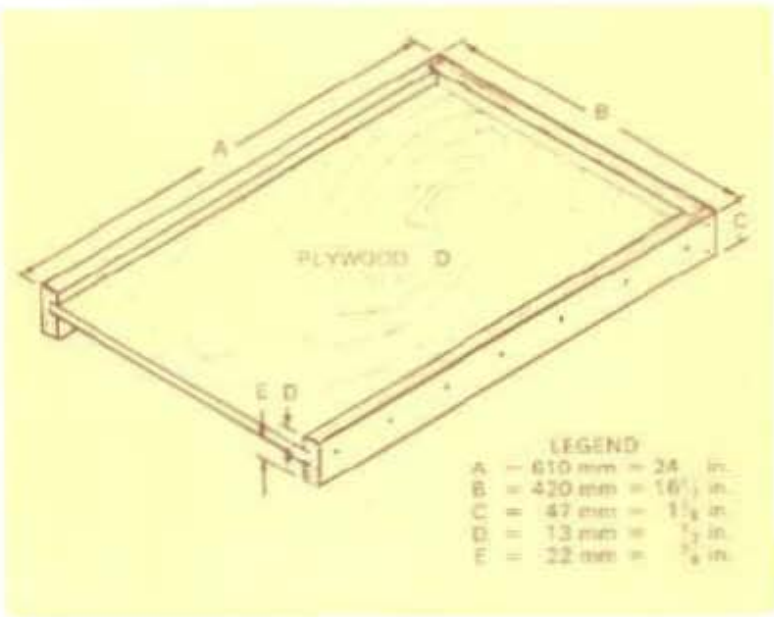


Fig. 3. Hive bottom board for standard Langstroth hive

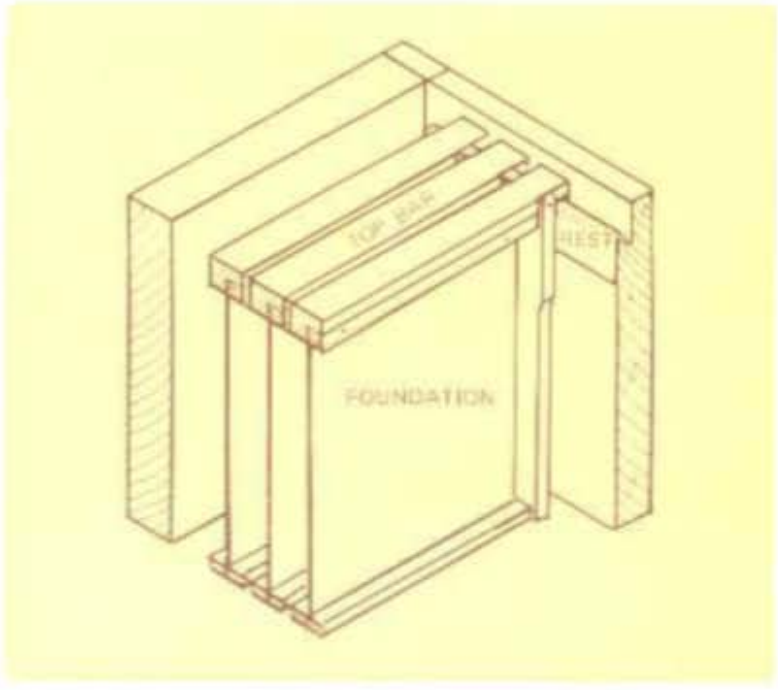


Fig. 4. Cut showing ends of top bar sitting on metal rest.

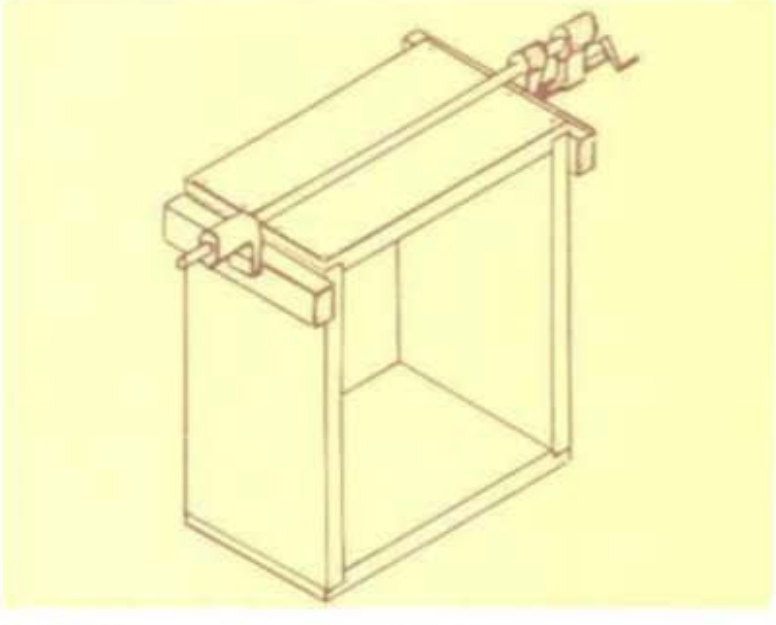


Fig. 5. Preparing to nail super using clamp.

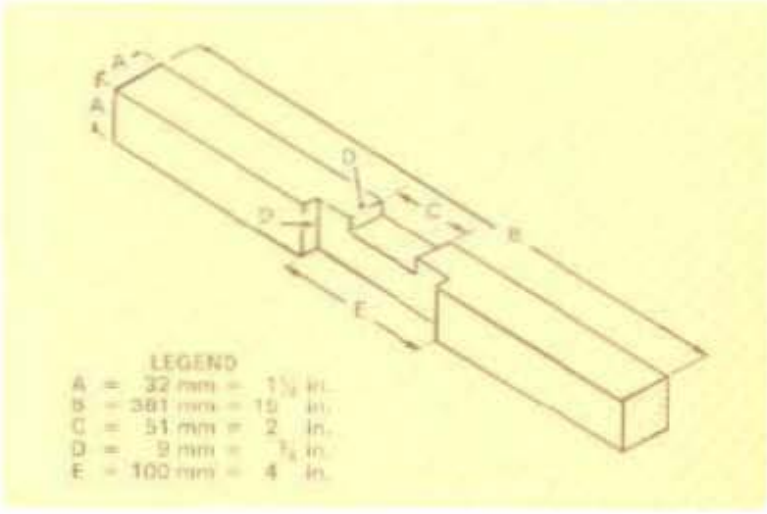


Fig. 6. Entrance block showing both summer and winter entrances.

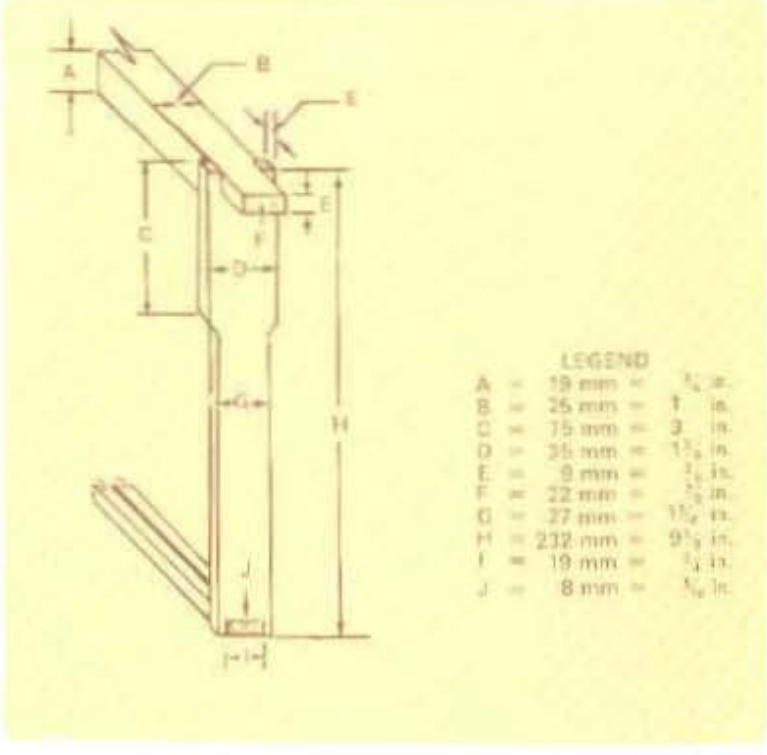


Fig. 7. Hoffman frame.

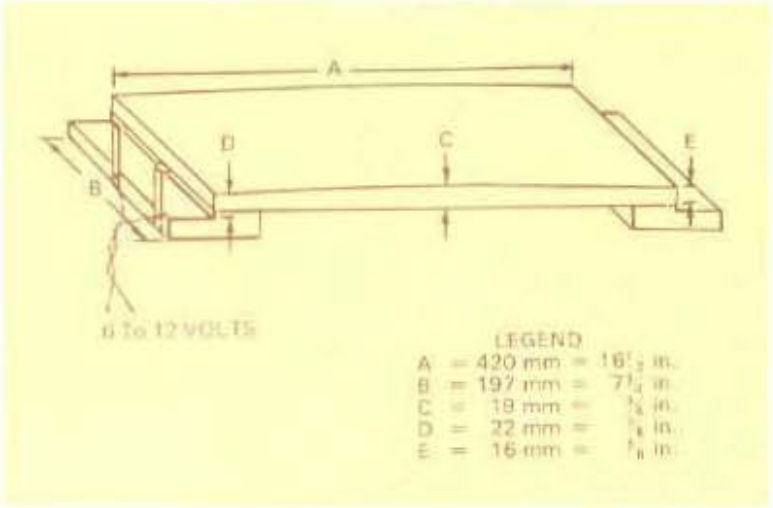


Fig. 8. Embedding board showing the convex curve of the board. This assures complete embedding of the wire.

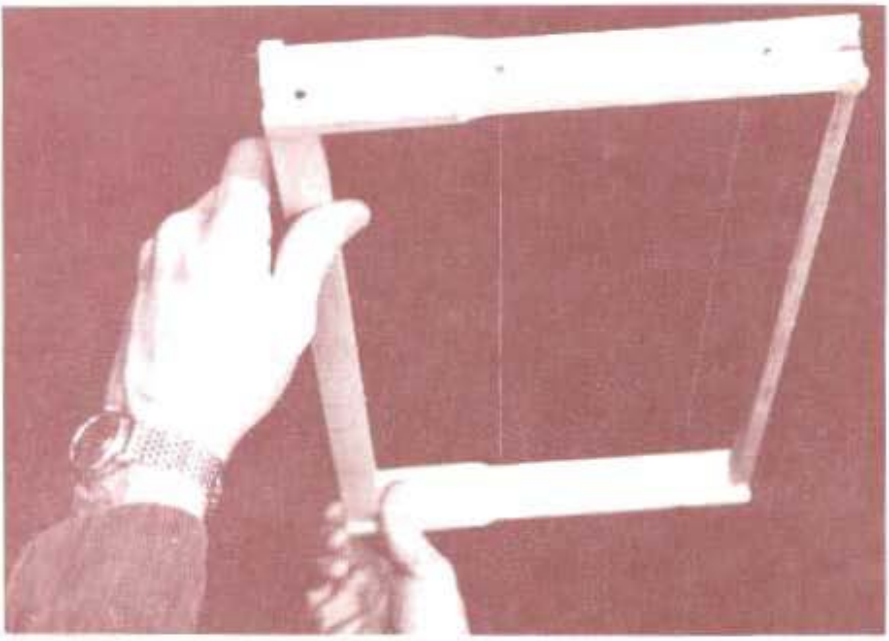


Fig. 9 Eyelets are used in the one end bar where the wire might cut into the grain. Note: Nail driven through end bar and into top bar.

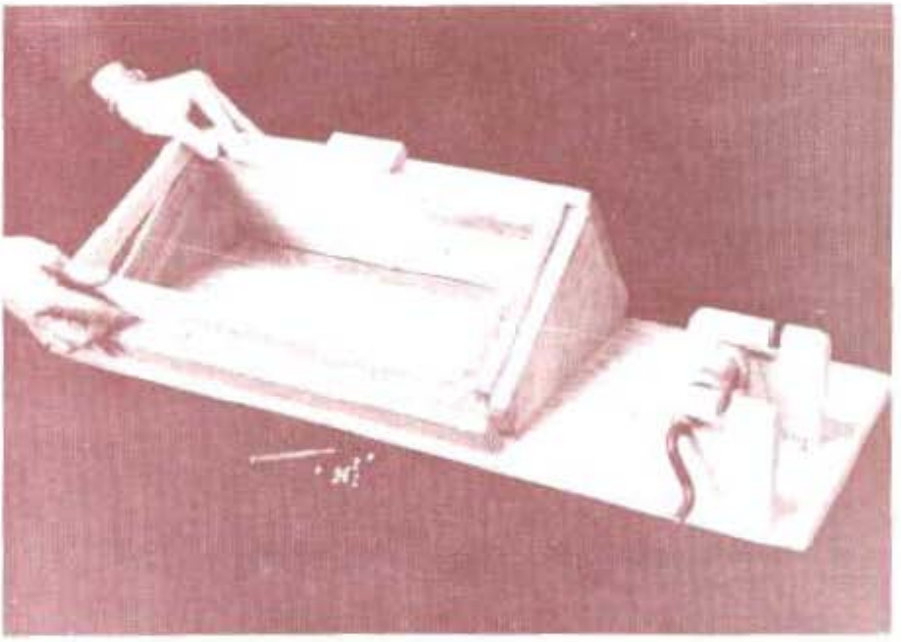


Fig. 10 Finlay wiring device. Any similar device for holding frames while wiring is essential. Note: Eyelets and punch and spring on spool of wire to prevent backlash and tangling.

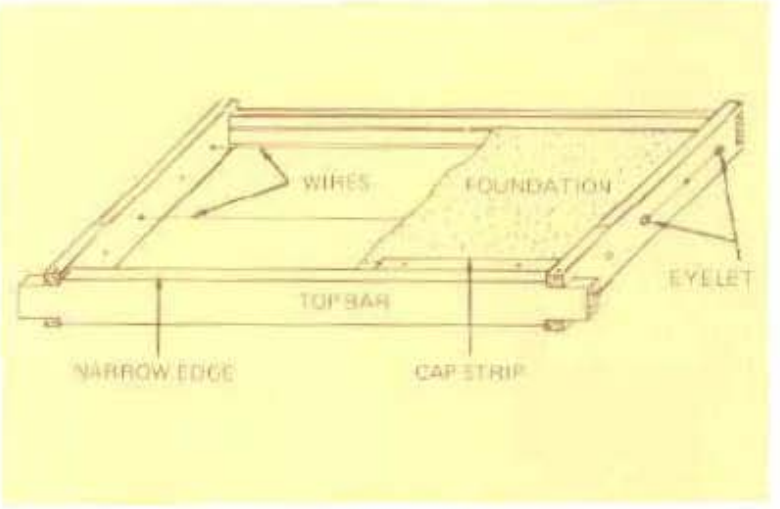


Fig. 11 Shows frame wired with two wires and cap strip in place

THE O.A.C. POLLEN TRAP

In order to trap pollen, it is necessary to force the returning foragers to pass through some type of a barrier that will dislodge the pollen pellets from their legs. Many devices have been developed for this purpose, but all have had certain disadvantages. Frequently, there is congestion and crowding of bees at the entrance. Drones, unable to leave the hive, add further to the confusion. Traps are often difficult to place in position and pollen is awkward to remove. The pollen frequently picks up excess moisture and may mold in the tray.

A pollen trap designed at the Ontario Agricultural College in the spring of 1962 appears to have overcome most of these problems. This trap, shown in Fig. 12, is placed on the floorboard and the pollen is collected in a tray beneath the colony where it is well protected from the weather.

Installation — To place this trap in position it is first necessary to lift the brood chamber off the floorboard and reverse the floorboard (front to rear). The trap is then placed so its entrance is now in the position of the original hive entrance. The bees will orient to this new entrance without any difficulty. The floorboard now serves to hold the pollen collecting tray. Pollen can be removed by sliding the tray out the open end of the floorboard (now at the rear of the colony) without the least interference with bee flight.

The Pollen Tray — is made of a frame of 25 mm (1 in.) wooden strips of a size 483 x 368 mm (14$\frac{1}{2}$ in. x 10 in.) that will easily fit inside the floorboard. Over this frame is fastened a piece of cloth — such as a used sugar bag — to act as a floor for the pollen tray. Wooden slats below the tray should hold the cloth about 25 mm (1 in.) above the floorboard. The pollen is collected in a relatively thin layer over this rather large shallow tray. With air circulation both above and below, the pollen does not tend to pick up moisture or mold, and it need only be emptied every 2 or even 3 days. Bees are prevented from gaining access to the pollen by a 4.2 or 3.6 mm (6 or 7 mesh/in.) galvanized screen horizontally placed above the tray.

The Pollen Barrier — is composed of two thicknesses of 5-mesh galvanized screen spaced no closer than 6 to 8 mm (¼ in. to 5/16 in.) apart, and extending horizontally over most of the base of the colony. This gives a relatively large area 330 x 280 mm (approx. 11 in. x 12 in.) through which

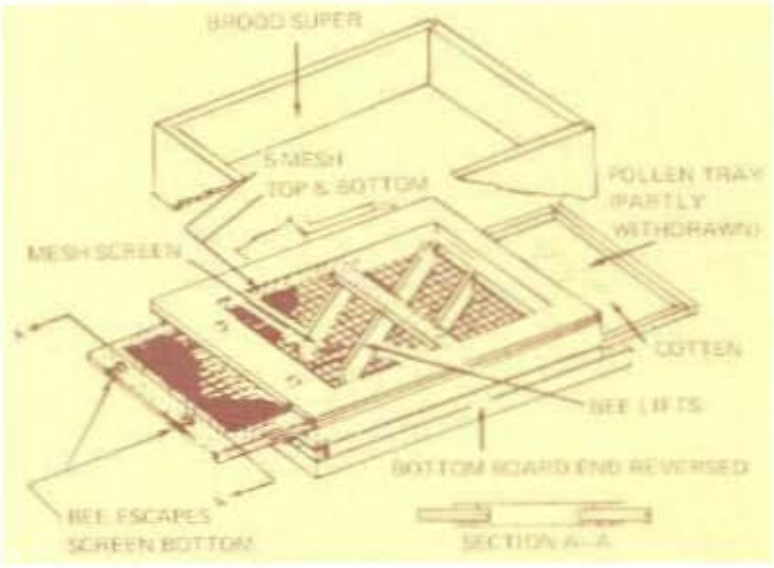


Fig 12 O A C pollen trap partially assembled

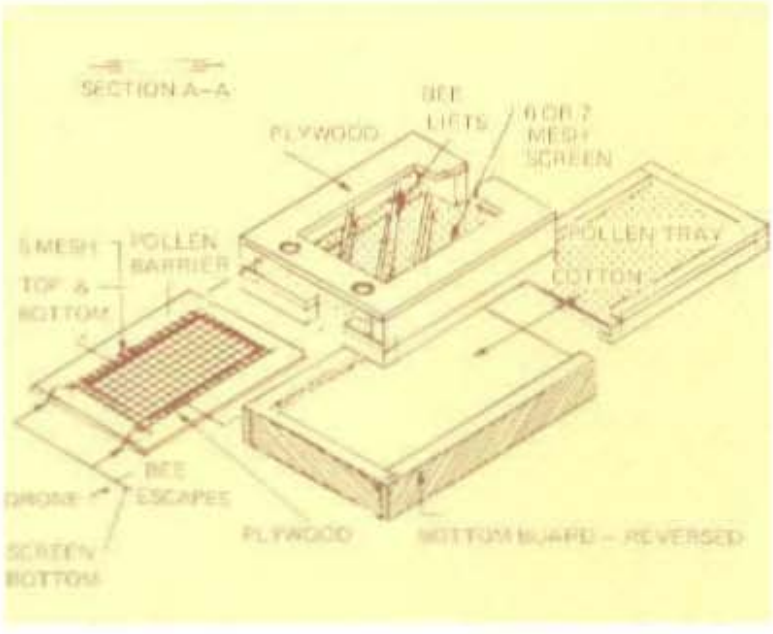


Fig 13 Diagram of O A C pollen trap showing individual parts

Fig. 14 Pollen trap in position beneath a standard Langstroth hive. Pollen tray partly withdrawn.

the bees may pass. On the average a 50% increase in trapped pollen was obtained by using a double screen, rather than a single screen. The pollen barrier is fastened on a plywood slide that may be slipped out of the trap at any time that pollen collection is need to be temporarily discontinued. This does not involve lifting the cubby off the trap and would permit an operator to remove the pollen barrier during the honey flow. The edges of the plywood slide bearing the pollen barrier should be coated with oil or grease to cut down on propolizing by the bees.

Bee Lifts — are provided by fastening to the lower screen three slats of wood placed on edge. These are placed diagonally in the trap and angled so as they just clear the pollen barrier screens. These lifts permit the bees to readily run up to the pollen barrier and result in a much more uniform distribution of pollen in the trays.

Drone Exits — are provided by drilling two 25 mm (1 in.) holes through both the front rim of the main trap unit and through the rim of the pollen barrier slide directly beneath it. Two V-shaped notches are then cut to connect the drilled holes in the front edge of the pollen barrier frame, leaving a space at the front margin just wide enough for a single drone to pass through. A small piece of screen is then tacked over the lower side of this hole and notch. This simple arrangement permits the drones and many workers as well, to leave the hive without passing through the pollen barrier screens. Returning bees then find their way back through these small openings.

The weight supporting sides frame of the pollen trap is constructed of 19 mm ($^{3}/_{4}$ in.) lumber to form a rim about 76 mm (3 in.) deep. The balance is made of 6 mm ($^{1}/_{4}$ in.) plywood.

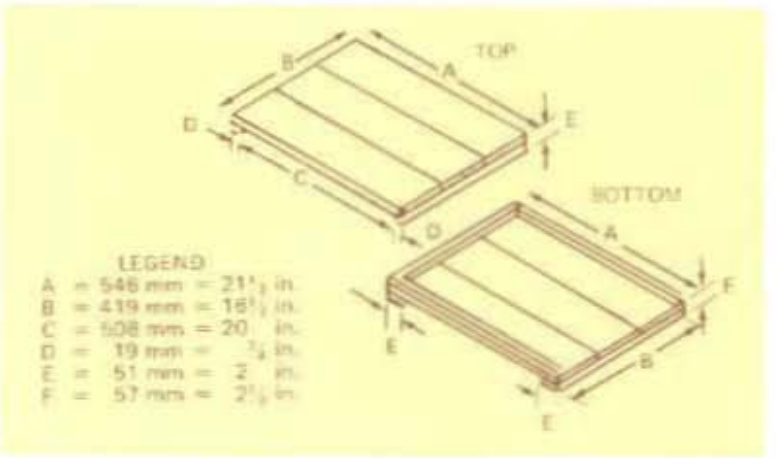


Fig. 15. Langstroth hive cover and bottom board used for migratory beekeeping.

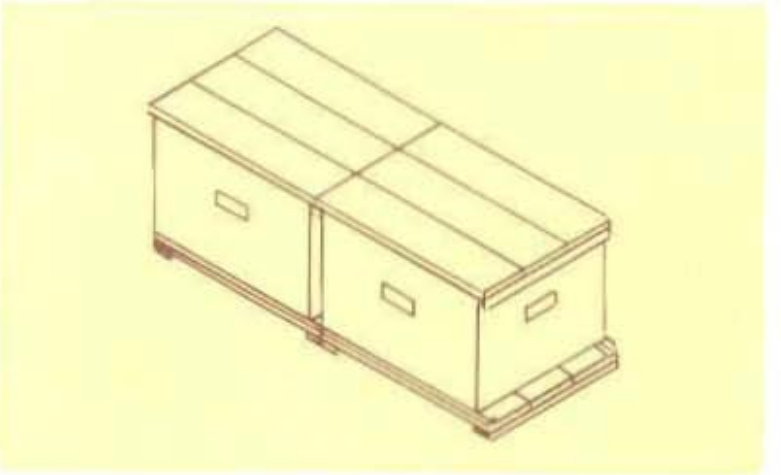


Fig. 16. Two single super hives in position showing close fit of bottoms and covers. Note: No overhang of the cover on the side permits close side by side placement of hives.

Records kept during the season showed that at Guelph an average colony could be expected to yield 0.9 kg (2 lb) of pollen a week. In certain areas, as much as 0.45 kg (1 lb) a day has been trapped from a single hive. It has been found that even with this trap design, at least 33% of the pollen gathered by the bees was carried into the hive through the pollen barrier. There appeared to be no reduction in brood rearing or honey

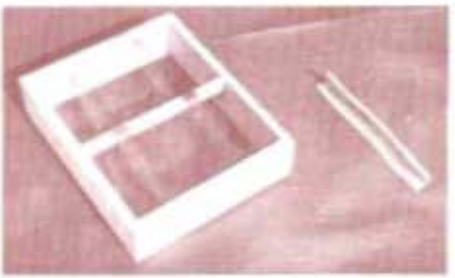


Fig. 17. Clustering screen and tuck-in screen.

Fig. 18. Two super Langstroth hives with clustering and entrance tuck-in screens in position. The hive is securely fastened together with 9 mm (⅜ in.) steel strapping.

production even though traps were kept on colonies throughout the whole season.

MOVING BEES

In British Columbia migratory beekeeping has become an established practice. Excellent all weather roads and improved vehicles enable a beekeeper to load two hundred colonies of bees and move them several hundred miles within a few hours. This practice is important in providing honeybees for pollination of legumes and fruit crops. In recent years there has been a trend towards moving strong, well provisioned colonies from the Peace River region for overwintering in the milder regions of the Okanagan and lower Fraser Valley. The following spring such colonies are used for tree fruit pollination in the Okanagan and as a source of package bees or nuclei for spring re-establishment of colonies in the Peace River region.

When hives are to be moved the cover, supers and bottom boards should be securely fastened using steel strapping, hive staples, or latches. Clustering screens, approximately 10 cm (4 in.) deep, may be placed on top of the hive. A folded tuck-in screen (Fig. 17) can be placed in the entrance way during the evening when the bees are all in from the fields. Screens provide ventilation and clustering space for the bees and are especially useful if colonies are to be transported during hot

weather. In case of emergency moves, or moves undertaken during cool weather, it is more practical to move hives without screening. When hives are to be moved without screens, begin loading at dusk, early enough so that the operation can be completed just before dark. Smoke the entrance of each hive before loading and leave one or two hives to attract stray bees. These hives could be located near the back of the apiary site and should be loaded last.

When hauling bees, beekeepers must take every precaution to ensure that stray bees do not annoy the public. Whenever possible travel at night; carry enough fuel for a non-stop trip. If you must stop then do so in a secluded spot away from habitation. Because non-beekeepers have a real fear of bees, carelessness in transporting bees through communities and on public highways can only result in poor public relations. Despite every precaution there will always be a few stray bees clinging to the outside of the load.

All hives should be securely roped down onto the truck deck. Although the vibration, and cooler temperatures, while the truck is moving will quiet the bees, they may form a cluster on the outside of the hive entrance.

Any beekeeper planning on frequent moving of hives, would be well advised to build covers and bottom boards to the dimensions shown in Figs. 15 & 16. By using such bottom boards and covers hives can be set close together. The dimensions of the protruding entrance of the bottom board coincide with the combined 38 mm ($1\frac{1}{2}$ in.) overhang of the cover on the front and back hive. The absence of overhang on the sides of the cover permits close side-by-side placing of hives and reduces the chance of dislocating bottoms and supers in transit. This type of migratory equipment results in a tight fitting, compact load which is not possible when using conventional bottoms and tops or those of varying design and size.

CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm^2)	x 0.15	square inch
square metre (m^2)	x 1.2	square yard
square kilometre (km^2)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm^3)	x 0.06	cubic inch
cubic metre (m^3)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2.5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre