An A-Frame Modular Beehive[1]

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THE STANDARD beehive of today, designed and patented by Lorenzo Lorraine Langstroth in 1852, was an advance over previous hives of such magnitude that further significant improvement was neither obvious or considered by many as possible.

Langstroth had discovered an important behavioral characteristic of bees; that they will not build brace comb or deposit propolis in spaces between opposing surfaces inside the hive which are between 3/16" and 3/8" apart. Exploiting this discovery of "bee space," Langstroth designed his hive with opposing surfaces between and adjacent to all movable internal parts spaced 5/16" apart. The result was the first practical movable frame modular beehive, now generally adopted remarkably unchanged excepting for numerous useful modifications in the construction and dimensions of its parts.

Still to be achieved, however, is the design of a hive of the same general utility which eliminates the necessity of heavy lifting associated with many aspects of hive management for those beekeepers who must or prefer to do so.

Thus, the broad objective of the experiments reported now was to design a new modular hive body with the following properties: 1) in multiple combination, the beekeeper has access to each module individually without lifting or disturbing any other module, or all are accessible simultaneously; 2) can also be whole hive-body manipulated interchangeably as well as used freely in combination with standard Langstroth equipment, 3) *a priori* must provide well-controlled internal bee space surrounding and between all movable parts. Other objectives were envisioned as will be described.

The general concept of a triangular shaped A-frame modular hive requiring triangular frames for brood and surplus honey was quickly recognized for its potential. But the structural detail for a hive body plan of that shape which would impart functional simplicity in accord with the overall objectives was not at all obvious; two of the three rectangular sides of the A-frame hive body must be accessible to the bees, while one of these and the third side must be accessible to the beekeeper.

The solution, once recognized, turned out to be uncomplicated. The basic module consists of a perforated rectangular panel with two triangular end pieces attached at the edge of this panel in opposing positions (Figure 1).

Frames of triangular shape rest on two 5/16" strips across the panel which are perpendicular to the end pieces. The frames are further uniformly positioned by two strips of triangular cross section placed at the open opposing edges of the panel where they abut the corners of the frames (Figure 2). Thus all three sides of the frames become one bee space from any opposing flat surface whether it be covers or perforated panels of the same or another module.

The modules may be stacked in alternately facing manner with the perforated panels downward so that the panels transect the interior of the stack (Figure 3). It can be seen that each module provides the ledge upon which rests the bevelled edge of the next module above it. Also shown in place in Figure 3 are covers for the alternately exposed sides of the modules. The side covers in this prototype of the A-frame hive are held in position by small brass hooks.

The frames in the bottom module of a four-module stacked hive are shown exposed in Figure 4. Individual frames may be readily withdrawn horizontally. Thus, since any or all covers may be removed simultaneously, hive management plans which involve the

[1] Patent pending.

[2] Gleanings in Bee Culture, April 1975, "The Aspinwall Non-Swarming Hive" by Lawrence Goltz.

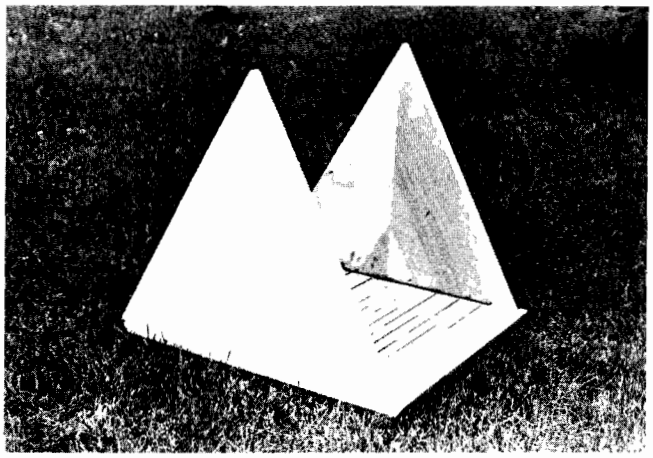

Fig. 1 (Photo by Dr. Norman A. Nelson)

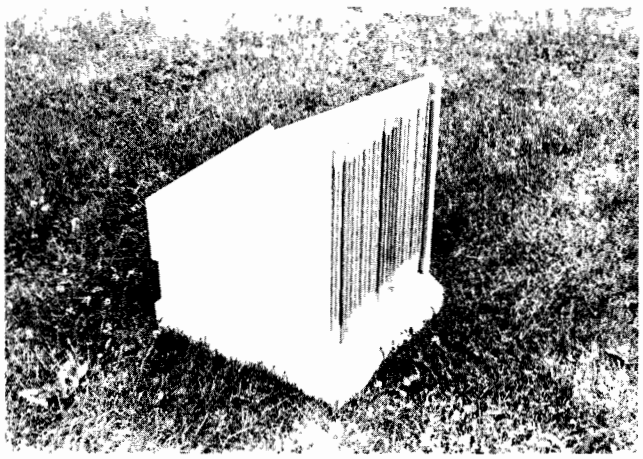

Fig. 2 (Photo by Dr. Norman A. Nelson)

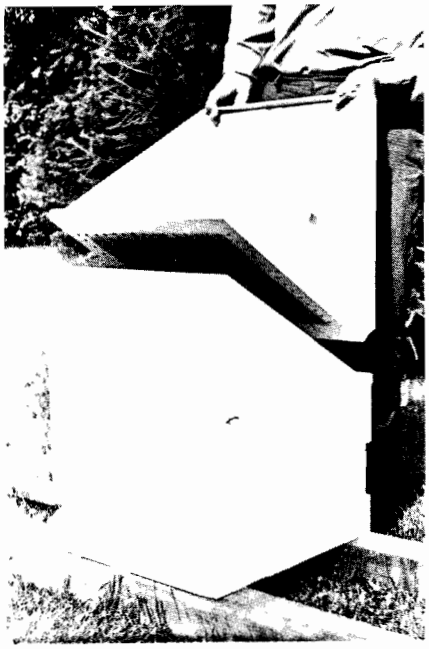

Fig. 3 (Photo by Dr. Norman A. Nelson)

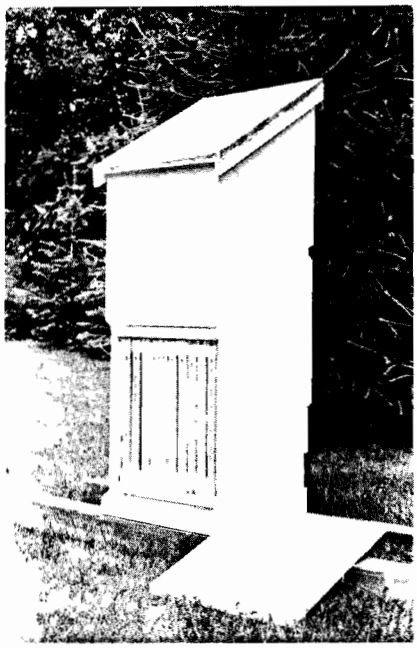

Fig. 4 (Photo by Dr. Norman A. Nelson)

reversal of whole hive bodies, or the exchange of frames in any way, can be accomplished a frame at a time, if desired, while the A-frame modules remain in place.

The hive stand and bottom board, top cover, inner cover, and queen excluder are adaptations of their conventional counterparts. However, by sizing the openings in the perforated panel to exclude the queen, the panel of that module can serve as its own queen excluder.

Triangular shaped brood comb foundation was improvised for these experiments from commercial Dadant Duracomb. Surplus honey as extracted, cut comb, or comb sections may be produced in the A-frame modules in triangular frames of the same size as brood frames (17⅜"), except that frames to hold comb honey sections are wider (2"). The triangular comb honey sections are novel, and can be sized so that the frame will hold either four or nine sections.

Perforated triangular dividers are used between frames of comb honey sections; these can also be used between brood frames, thus providing cluster space to discourage swarming in accord with the Aspinwall principle.[2] Further cluster space is inherent in this hive design due to the presence of the perforated panel.

A unique distinction of the A-frame over the Langstroth hive is the capability for numerous modular arrangements in addition to the vertical stacking as shown in Figure 4, the only arrangement possible for the Langstroth hive. Two examples of this A-frame capability are shown in Figures 5 and 6, the latter in combination with Langstroth hive bodies. Each is arranged for the two-queen management system. The same surplus supers are accessible to the bees from both brood chambers in each example, while each brood chamber has separate access to the outside. When the honey flow is over, or as desired, the brood chambers may be reunited for wintering with a single queen. The following spring the brood chambers may be separated and the second queen raised or introduced prior to the addition of supers. These and many other possible arrangements considerably extend the beekeepers' options.

Another unique characteristic of the A-frame hive is that bees may be blown out of the modules while still in place, after the side covers are removed. This capability is obvious from inspection, *e.g.,* of Figure 2; the air stream is directed parallel to the perforated panel. This simplifies such practices as requeening, removal of one of two queens, and the harvesting of surplus honey. In the latter instance one or more of several frames of triangular section comb honey may be harvested when freshly capped and before the remaining frames are finished, since these frames are as readily movable as brood combs. Also, since both brood and surplus honey frames fit into the same module, the former may be used as decoys in surplus honey supers.

Winter survival of the bees in the A-frame construction is favored due to better ventilation and less dampness. The sloping bottom board prevents entry of water from snow or rain and affords gravity assistance in the removal of dead bees during winter. Moisture condensed and frozen inside the hive on the sloping cover melts during winter thaws and flows out of the hive. Further, no entrance reduction is necessary so that much of the removal of winter dead bees occurs spontaneously, thus avoiding the thick wet mat of dead bees so often found in conventional hives which contributes to poor circulation and wintering. It is because the grid effectively acts as a rodent barrier that there is no need for hive entrance reduction during winter. The bees move readily from module to module through the perforated panel. The nature of the perforations in the

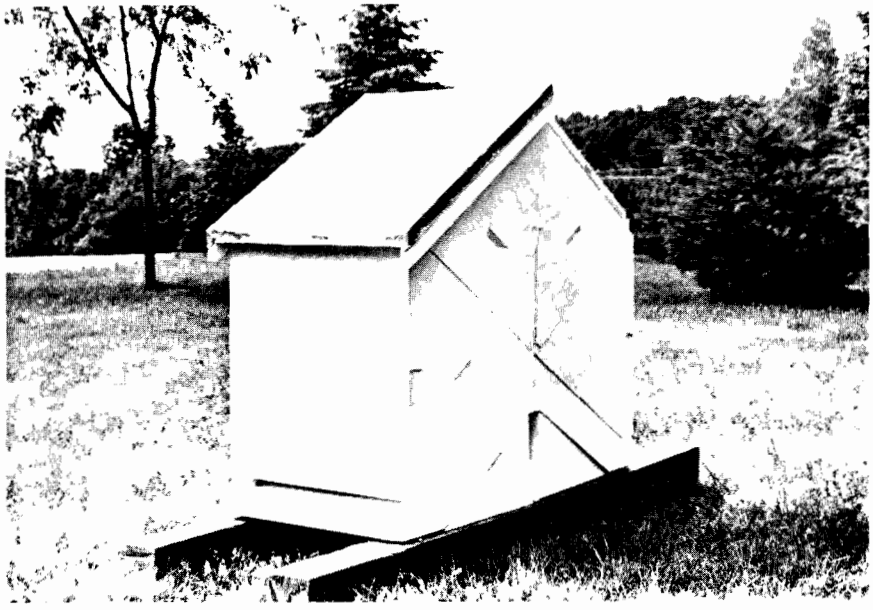

Fig. 5 (Photo by Dr. Norman A. Nelson)

panel of each module can be quite varied; but the degree and type of perforation should be maximized to facilitate upward movement of the winter cluster in extremely cold weather. In some of the modular arrangements (*e. g.,* Figures 5 and 6) there is one interface between two of the modules which does not involve the grid of either; and therefore requires a perforated adapter similar to present zinc excluders to control bee space between the two sets of frames.

The triangular frame, being completely symmetrical, may be rotated in its own plane to any of the three possible positions. Thus there is an inbuilt "inversion" capability, a practice which is well known to encourage bees to repair the lower edges of comb which they tend to damage. Also, this practice is useful in encouraging bees to finish incomplete surplus comb honey in A-frames.

The A-frame hive offers new opportunities to a wide range of present and potential beekeepers for experimentation with hive management and, especially, for the production of comb honey in novel triangular sections. Beekeepers need not convert from standard Langstroth equipment to make use of the A-frame supers. ●

Fig. 6

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