Notes by David Heaf on

Anweisung zur nützlichen and angenehmen Bienenzucht für alle Gegenden

by

Pfarrer Johann Ludwig Christ (1739-1813)

Rodheim, Hessen, Germany

Second enlarged and improved edition, with six copper plates, Fleischerisch Buchhandlung, Frankfurt & Leipzig, 1783.

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In making these notes I have concentrated on points that are most likely to be of interest to beekeepers working with the vertical, tiered top-bar hive of Abbé Émile Warré. The chapters contain the following:

Contents of the book

Comments on the units of measure used by J. L. Christ

Christ was explicit about the linear measure he used. They were Paris inches (*Zoll*) based on the *Pied du Roi*, the Paris foot (*Schuh*). A Paris inch is 2.7069 cm. In these notes the size will be given in inches (Paris) followed by its metric equivalent.

But when it comes to honey yields and amounts left for overwintering, the matter is far less clear. When referring to honey yields Christ uses the *Maaß*, a volumetric unit, and the *Pfund* (pound), a gravimetric unit. He equates 1 *Maaß* honey to 5 *Pfund*. In a few places he uses *Schoppen*, another volumetric measure (1 *Maaß* 4 *Schoppen*).

Weight: I have used 'pounds' throughout. In the Germany of 1783, the pound varied from place to place and trade to trade. It has been impossible to establish with certainty which pound Christ was using, and thus its metric equivalent. The metric system was introduced in France after the 1789 revolution, so it seems very unlikely that the *Pfund* in Christ's time was 500 grams, as it gradually became in parts of Germany during the following century. Two possibilities have shown up in researches; 459 grams (Hessen) and 467 grams (Prussia). I have adopted 459 grams for the purposes of this article. As this is so close to the English pound (454 g) I have made no conversion from Christ's figures for pounds.

Volume: Christ gives the quantity of honey in a single hive-body box as 2 *Maaß* or 10 *Pfund.* Taking the *Pfund* as 459 g and the density of honey as 1.4 kg/litre, a *Pfund* of honey would have a volume of 0.328 litres. As Christ states that 1 *Maaß* of honey weighs 5 *Pfund*, this gives 1 *Maaß* a volume of 1.64 litres. But this corresponds to neither equivalent in litres that I have been able to find for his time, namely 1.5 litres or 1.783 litres (Rhineland).

The reader is therefore advised to take the figures for honey quantity as provisional. They are very unlikely to be less than stated below, but could range from three to nine percent more. That the pound Christ used was possibly the Prussian one (467 g) is suggested by Eric Zeissloffs deductions (quoted in an Appendix below) based on other data in Christ's book. This would mean the weights stated below in 'pounds' should be 3% higher. However, this is of little significance in practice.

Notes on selected parts of the book

Preface page IV: In Christ's locality, skeppists lost all their bees in bad years. Straw hives working on the magazine principle, i.e. divisible with new rings added underneath, are justifiably considered perpetual. Magazine hive users would not exchange their hive for four skeps. Christ finds straw magazines difficult to manage, and you cannot see into them. A wooden magazine hive is more durable than a straw one. [It seems clear, therefore, that Christ got his hive concept from straw magazine hives managed in the way he adopted.]

Chapter 3: The best and most beautiful type of hive

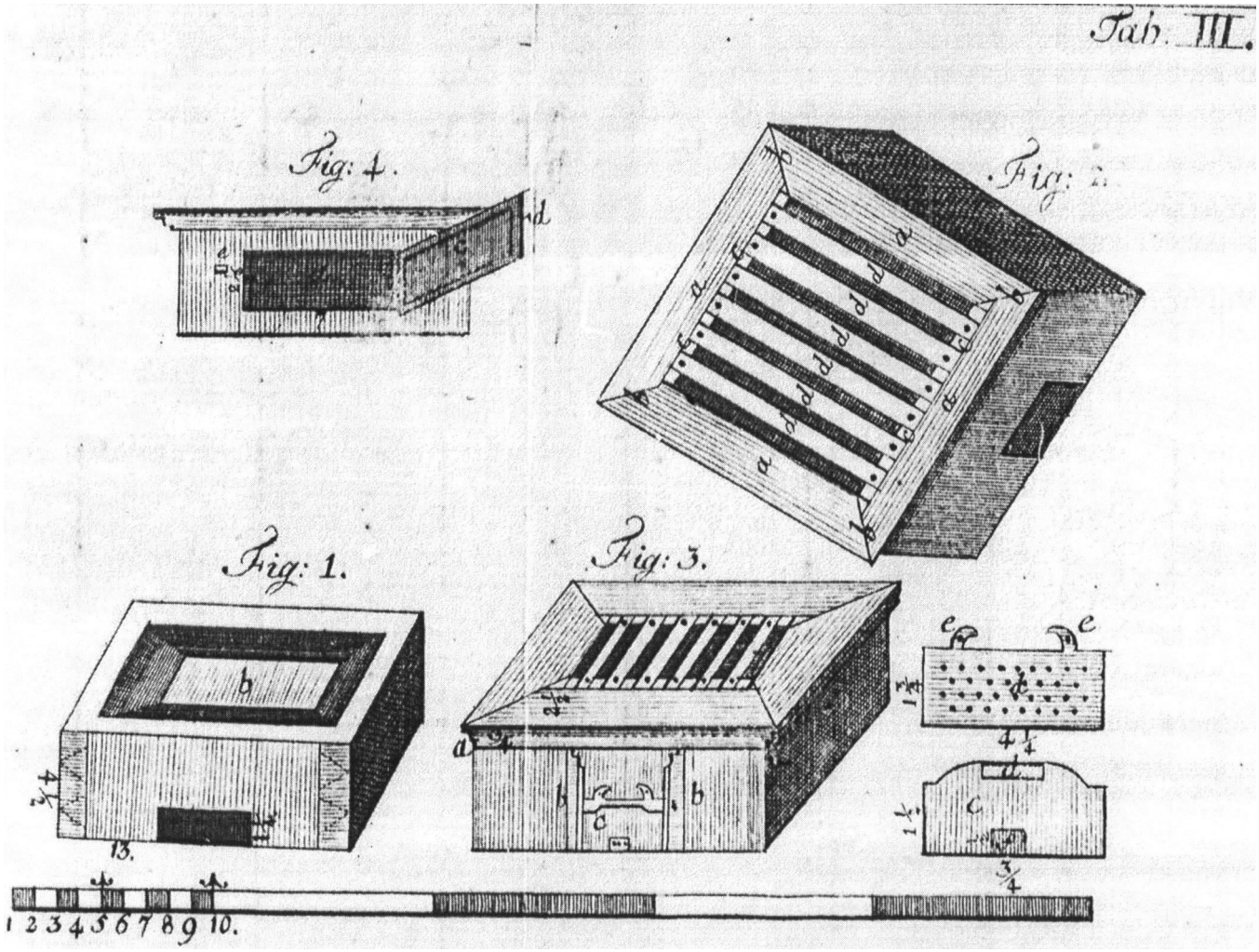
Section 4, page 32-4: A hive body box is 4½ inches (122 mm) deep and 13 inches (352 mm) square measured on the outside. [There is no clear statement of the inside measurement or the wall thickness anywhere in the book, but from copper plate III, figure 1 (see below) the thickness of the wall seems to be about an inch., but it is not clear whether it was a Paris inch. The boards (*Dielen*) used were about an inch thick. The inch used by joiners in Hessen at the time could have been as small as 24 mm. If it was the Paris inch, 27 mm, then the internal size was 298 mm, i.e. very close to Warré's 300 mm. If a board was only 24 mm thick then the inside measurement was 304 mm which is still very close to Warré's specification.]

Every box has an entrance 1¼ inches (34 mm) high by 4 inches (108 mm) long and each entrance has two metal vertical sliding plates. One is perforated with bee tight holes. The holes must be smaller than the width of a bee's head. The other is to restrict the aperture to ¾ inch (20 mm) wide and ½ inch (13.5 mm) high. They must be fairly tight in their grooves so as not to drop down and trap the bees inside. Each box has a shuttered window 7 inches (190 mm) by 2½ inches (68 mm) on the side opposite the entrance. If light gets in through the window, the bees build against the glass. Each box has 6 top-bars 1 inch (27 mm) wide mounted from front (entrance) to back (window). The top bars are nailed onto bars supported by laths front and back that are glued and nailed on to the upper rim of the box. Corresponding laths at the sides are butted to the others with a 45 degree mitre (e.g. Fig. 2). The inside edges of the side laths align with the inside surfaces of the box sides. [The depth of neither the top-bars nor the laths is stated, but as they are all in the same plane, the comb height probably comprises the height of a box, namely 122 mm.]

Copper Plate III (next page)

Fig 1: Front and top view of top box. Letter (a) [obscured on my copy] entrance hole [dark area at front/bottom]; Letter (b) a hole for a glass pane in the rear side [the perspective drawing here looks somewhat unconvincing!]. [The front and back are jointed into the sides, but Christ says that if you cannot manage such joinery they can simply be nailed together as butt joints, in which case the sides need to be shorter to maintain the 13 inches (352 mm) squareness.]
Fig. 2: Top/front view showing the four laths (a) mitred together (b); (cc) strips of wood fixed under the front and back laths to support the six top-bars (d).
Fig 3: The four laths project ¾ inch (20 mm) and form a seam; (b) small strips of wood either side of the entrance hole with grooves to form runners; (c) the metal entrance aperture (f) restrictor (see detail to right) with the perforated metal plate behind (see detail (d) to right); The restrictor has the top edge bent forward to form a handle [in the text this is referred to as 'g', but appears as a 'd' on the figure.]; the perforated plate has two lugs (e) under which can be inserted a pointed instrument to lift or lower it.

Fig. 4: Rear view with window pane (a) in recess supported by strips of wood (b, this letter is obscured on my copy) and a hinged shutter (c) in front to keep the hive dark inside; (d) wire hook that slots into a wire eye (e).



Page 34/35: The top is covered by a board. But as this is inclined to crack in the heat it is better to make a square hole of 6-8 inches (163-217 mm) and put a pane of glass in it. Make one such cover for every six or seven boxes. This cover can be glued or screwed down [the glue Christ used between boxes and between the boxes and the floor board or for sealing crack was easily broken with a suitable tool. On page 113 in the chapter on equipment he says that the glue is best if mixed with some cow manure.]

[There is no mention of insulation over the cover board and no specific design of a roof is given. In the legend of Plate IV which shows a six-box hive with its own roof, he says only make a separate roof if the hives are not kept in a roofed bee-stand.]

No nails must project above the plane of the top bars or the laths as they will catch on the piano wire that is drawn between the boxes.

Section 6, page 37: The magazine hive has many advantages including a low swarming rate and a constant renewal of comb. The status (stores, queen cells, bees etc.) of each box can be checked through the windows. Swarming is inhibited by adding another box underneath when the previous one is half or two-thirds full of comb.
Queen cells observed through the windows indicate when to do a split.
The walls must be planed smooth on the inside to save the bees work in gnawing them smooth and having to carry out the debris.
The top bars are placed so as to force the bees to build along them and thus ensure good ventilation from the entrance [i.e. cold way].

Page 38: Top-bars are better than a board with a hole in it. This was tried initially but it accumulated a lot of debris allowing wax moths to breed on the upper side, so the grid of top-bars was adopted. Also, it caused combs to be built across the window, thus obscuring the view of other combs.
Straw magazine hives lean and bend under the weight of honey. They are prone to mouse damage.
A large empty straw eke (hive body section ring) is bad in that it creates a cold space and is especially bad in spring because the hive with a large empty space is more difficult to defend against robbers.
Shallow hive body magazines easily allow honey to be given to a colony that is short. A late swarm that has no time to build up all its winter stores can be given a box of honey on top and a box of comb underneath.

Section 7, page 39: Two to three weeks after a swarm is introduced and the fourth box is half to two-thirds full of comb the next box is added underneath. Comb building stops in August. Between two and three hours after adding a box, the entrance of the one above is closed. A stock not designated for swarming is given a new box in April after the robbing period is over provided there is enough forage and bees to justify it. Do not add two boxes at once because: 1) it is too far for the bees to climb up with their loads, and 2) it is not as easy to defend the hive against robbers, moths, ants etc.
New boxes are added in the early morning when the bees are quiet.

Note 30, page 40: The bees need space to stand in front of the entrance. The floor is made 1 foot 8 inches long (541 mm) and 1 foot 3 inches wide (406 mm). [As the box is 13 inches (352 mm) square there is a 7 inch (189 mm) wide alighting board the full width of the front.]

Note 31, page 41: When adding a new box underneath, it is best to substitute a new floor at the same time as there are usually many bees on the old floor when the hive is lifted. The old floor is left next to the hive so that the bees can re-enter.

Page 41: If you want to make increase by using the swarm impulse, do not give a new box underneath until you have let them swarm. Once the prime swarm has left, put a new box underneath and move the hive several times away from its original site [in order to lose field/flying bees].
Note 32: Bees can be anaesthetised with puff balls, a fungus commonly found in cattle pastures. These are almost indispensable in beekeeping.
Casts are uncommon if a new box is given after the prime swarm has left. If they do happen they can be housed, helped along with spare comb and honey and if necessary united in the autumn.

Page 43: If starting from a skep, let it swarm and put the swarm in the magazine hive with three boxes. Then put the swarmed skep on a single hive-body box using a suitable adapter board and close up the skep entrance. The skep entrance must be facing the same way as that of the box and the combs must be aligned with the top-bars. The bees continue to build down into the box. It can happen that a swarmed skep can build up two boxes and fill the upper one with honey. An skep colony that has not swarmed will fill between three and four boxes with comb in a summer, the top two of which are filled with honey.

After 24 August (St Bartholomew's Day), if two boxes are full of honey, that comprises the winter stores (20 pounds) of the colony.

To cut between boxes or between a skep and the adapter board use piano wire No. 0, one *Elle* (ca. 600 mm) long with a wooden handle at each end. Take the skep some 30 metres away from the apiary, leave open for the flying bees to depart. Drive the remaining bees into two hive-body boxes and put them back under the colony in the apiary. Before this operation, the queen may be either in the skep or in the boxes below it. The bees can be driven from the skep by beating.

Page 45: If adding a box of honey to a colony all honey stores must finish up (before winter) at the top with no comb-only boxes in between two boxes of honey. Empty comb is always placed below the honey stores.

Page 46: Any uniting that is done aims to winter on 4 boxes of comb, the top two filled with honey.

Page 47: If skeppists could not be persuaded of the efficiency of the wooden magazine hive and were intent on asphyxiating their bees with sulphur, Christ bought up their bees to strengthen his own stocks.

Chapter 4: Making increase

Page 49/50: Shirach's methods are described: 1) mating nuc; 2) split.

Page 51: Christ's method: starting with four boxes with the top full of honey and the others containing brood, the bottom two stay on the original site and the top two are moved elsewhere in the apiary. Both halves are given a new box underneath. This can be done twice in a season at the end of April or beginning of May and again round St. John's Tide (24 June). It is better to do it only once. The stock must be observed beforehand to see that it is populous and swarm-ripe. The queen lays from 9 a.m. to noon. When she is not laying she will be in the top two boxes. Thus, if there is a chance of there being no suitable brood in the top boxes, the queen needs to be up there.

Page 52: To split a 5-box hive the split is made between the top three and the bottom two. For a 3-box hive the split is between the top two and the bottom box.

Page 53: Bees appear to work harder after a uniting than before it.
Do not make splits too early in the year. The right conditions are the start of swarming time, in warm weather, when there is plenty of forage and the hive is swarm-ripe.

Page 54: If the half of the split that is not left on the old site has too little traffic, then swap them or, if they are already near each other, bring them very close together so that they overlap the strong traffic flow. After a few days they can be moved apart again by two inches a day.

Pages 55-66, sections 4-26: catching and managing swarms etc.

Page 66: A hive that has not swarmed or not been split needs eight boxes.
Bees rarely build in a box that has been put on top. They only build in ekes put on top of skeps in years when there is a great amount of forage.
Too much space between the combs and the entrance makes the hive difficult for the bees to defend. Do not add more space until it is required.
If, in a good year, the hive is too heavy to lift to put a new box underneath, cut off the top two boxes with piano wire, knock the bees out of them at some distance from the apiary. Any bees that stay can be brushed off the combs as they are removed.

Page 67: In an apiary of 30 to 36 magazine hives, each year 5-8 are either split or allowed to swarm.

Chapter 5: Care of bees

Page 69: On a mild day in February the floors are cleaned and any mouldy comb is cut out. It is best to replace the floors with fresh ones rather than trying to brush the ones that have been in use as this cuts down on wax moth.

Page 69/70: Two boxes of empty comb is enough for the spring build up. The bees do not build readily on mouldy comb, but instead chew it away.

Page 70: By the beginning of March the bees should have half their winter stores left, whether or not there will be nectar or honeydew available for them in April. In 8 days in March they can eat what it takes them 8 weeks to eat in winter. For example, a particular strong stock consumed only 5 pounds in 8-10 weeks in winter. Two boxes full of honey is left for winter, i.e. 20 pounds. So there must be 10 pounds of honey at the beginning of March, i.e. one box full.

There will always be some stocks that need feeding despite the care one takes, especially in a bad spring. They can consume 20-25 pounds of honey over winter then starve in spring.

Page 71: Dilute honey for feeding with a sixth part of water. If it is fed warm, the bees go for it more rapidly. Feed in the evening or during rain in order to avoid robbing.

Page 72: Feeding stimulates swarming.

Page 75: A weaker colony is united under a stronger one.
Store a stock of honey sufficient for feeding requirements in bad years.

Chapter 6: Harvesting honey and wax

Page 101: If the harvest is taken in August, there can still be a lot of bees in the top boxes and the colony then gets angry. In September or October, most are below and only a handful in the boxes to be harvested. Harvest in the cool early morning of a promising day when the bees are at their quietest. It can be done in the apiary without carrying the whole hive some distance off. Close the entrance so as to minimise interference from the bees. As regards being sure to leave enough winter stores, it is safer to harvest in spring, but this then risks some of the honey being granulated. The boxes are separated with piano wire. Insert it on the entrance side and pull it along the combs towards the back. The cutting can be done the day before and then the boxes removed when the bees have calmed down again. The boxes can be removed without using the wire, but bits of comb left behind could obstruct replacement of the cover. The boxes must be carried away upside down in case any comb breaks during transport and falls on the ground. Alternatively, a board or tray can be placed underneath. Harvesting cannot be done without a helper.

Page 102: Each full box contains about 10 pounds plus ½ *Schoppen* (162 grams). The average honey yield per hive is 20 pounds. 25 hives yield 10 pounds of wax. A good hive has yielded 40 pounds in three weeks and, over a whole summer, 100 pounds. Leave 2 boxes of honey for winter. A good beekeeper holds a honey harvest in reserve to feed the bees in a bad year. There must always be left enough comb to satisfy the requirement for brood rearing in spring. More empty comb combined with spring feeding yields big swarms. The boxes that are harvested contain broodless and pollenless honey that keeps well.

Page 105: 20 pounds of honey and ¾ pound of wax are obtained from two boxes.

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Llanystumdwy
29th March 2008

Appendix

Calculations kindly supplied by Eric Zeissloff:

In Christ's book it says that an *Achtelzentner* (an eighth of a *Zentner*) is 13.5 *Pfund* (page 28). This makes 1 *Zentner* = 108 *Pfund*

1 *Zentner* = 100 *schwere Pfund* (heavy *Pfund*) = ca. 108 *leichte Pfund* (light *Pfund*) = 50.5128 kg

This makes a *Pfund* 467.71 g

The external source for these equivalents and other data below is the page entitled *Alte Maße und Gewichte (Hessen)* at http://de.wikipedia.org/wiki/Alte_Ma%C3%9Fe_und_Gewichte_(Hessen).

On page 105, Christ puts 1 *Ohm* equivalent to 80 *Maaß*.

In Frankfurt *Hohlmaße* (Volume measure), *flüssig Schoppen* (fluid *Schoppen*) = 0.3984 litres

But there are two kinds of *Maß*:

Schenkmaß = 4 *Schoppen* = 1.5935 litres (i.e. 4 x 0.3984)*
Eichmaß = 4½ *Schoppen* = 1.7926 litres*
Ohm = 80 *Eichmaß* (143.418) = 90 *Schenkmaß* (143.411 litres)

One can thus deduce that Christ used the *Eichmaaß*.
Thus a *Maaß* is 1.7926 litres.

According to Christ, 1 *Maaß* Honig is equivalent to 5 *Pfund* honey.
Thus 1.7926 litres (one *Eichenmaß*) is equivalent to 2338.55 g honey.

This makes the density of honey 1.33, which seems plausible.**

Notes by David Heaf:
* There is a very slight calculation error regarding these two figures on the wikipedia.org page which can be ignored.
** The American National Honey Council puts the density of honey with 18% moisture at 1.42 kg/litre.