



**Eva Crane Trust**

## **ECTD\_201 (ii)**

**TITLE:** Beekeeping

**SOURCE:** *Tools for agriculture: a buyer's guide to appropriate equipment* (3rd edn)

London: Intermediate Technology Publications in association with GTZ/GATE

**DATE:** 1985

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[for suppliers & equipment see also ECTD\_201 (i)]

# Feeders and other accessories

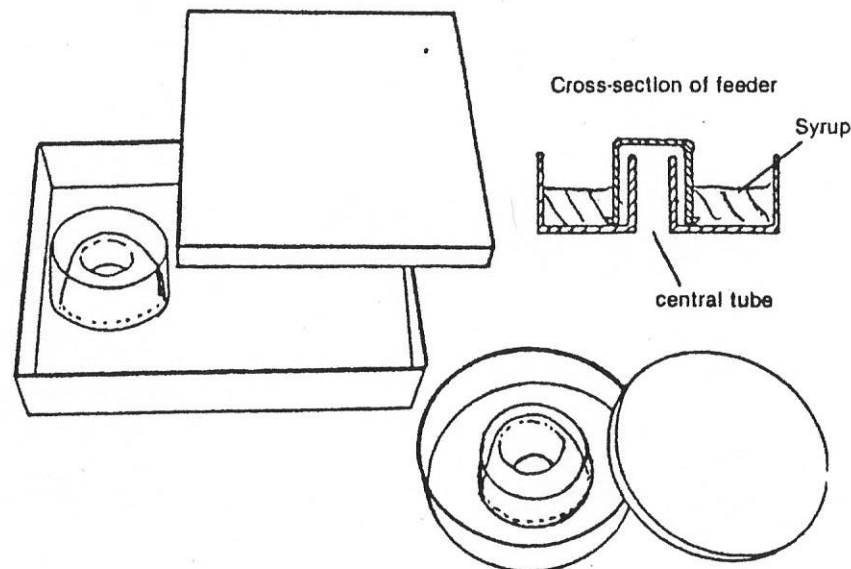
## FEEDERS

In most parts of the world it is necessary to make provision for feeding sugar syrup to bees — for instance to counteract some unexpected adverse weather, to build up a small nucleus made in order to increase the number of colonies, or to encourage a swarm, or other bees newly put into a hive, to remain there.

Feeders are placed: at the top of the hive above the top box occupied by bees; or inside the hive with the bees (in the form of a 'dummy' frame); or outside the hive with an entrance only from inside. Larger feeders are preferable for food that the bees must store for a dearth period. When it is important that the bees take the syrup immediately, a 'dummy' frame type is good.

Other materials are used for feeding bees, apart from honey of which an adequate supply should be left in hives as a matter of course. Combs of honey from another source may be used in the hive, but it must be checked that they do not come from a diseased colony. Dry sugar can be fed instead of syrup in warm weather, spread over the inner cover of the hive; it needs no special feeder. Dry sugar feeding will not lead to robbing, which syrup or honey feeding can do if other bees have any access to the food (most usual with an outside feeder).

Pollen and/or pollen substitute is fed by beekeepers in some areas where pollen supplies are deficient, but this also needs no special feeder.



## FLAT TOP FEEDER

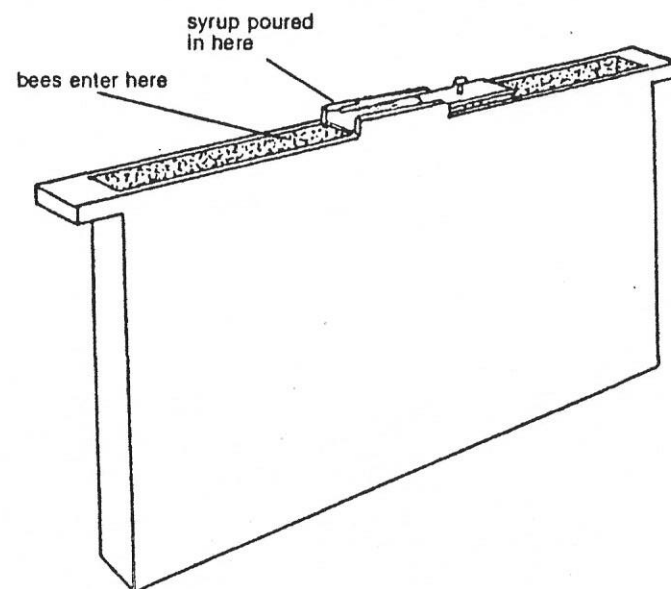
The drawings on the left show a large square feeder (the size of the hive cross-section) and also a smaller round feeder. Both have a central tube through which the bees enter from below, and a provision for them to have access to the syrup by walking down the roughened outside of the tube. An outer cylinder closed at the top prevents them from getting access to, or drowning in, the bulk of syrup.

The feeders shown are of plastic: the square one fitting the Dadant-Blatt hive is from:

**LEGA SDF**  
Via Armandi 19, 48018 Faenza  
ITALY

Round feeders are widely available. A square plastic feeder of intermediate size can be obtained from:

**R. LORHO**  
Saint-Loup, 28360 Dammarie  
FRANCE



## DUMMY FRAME FEEDER

This is sometimes called a division-board feeder. It conforms to the size of the frame-plus-comb in the brood box, where it replaces a complete frame. The bees enter from the top, and inside there is a float or some other provision to protect the bees from drowning in the bulk of the syrup. This feeder is safe from robbing, and its contents are quickly available to the bees, but the hive must be opened to fill it. The feeder shown is of plastic, for Langstroth hives, and is sold by:

**OLIFIN PRODUCTS**  
P.O. Box 10217, Te Rapa  
NEW ZEALAND

Another feeder of a similar type is obtainable from:

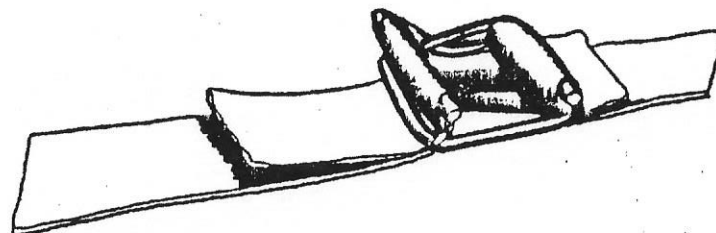
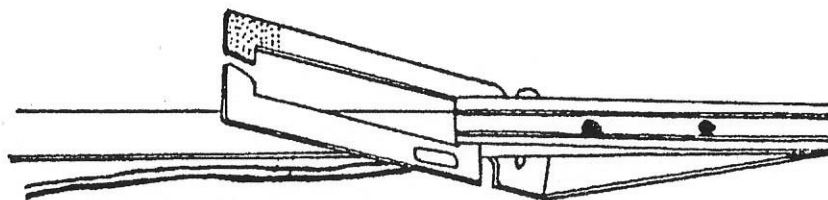
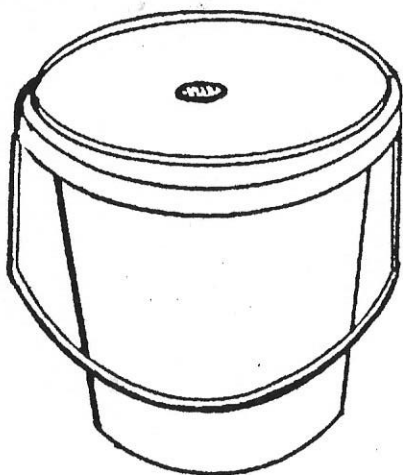
**STANDARD**  
Kifisias 75, N-Iraklion  
Athens  
GREECE

## PLASTIC PAIL

The plastic pail shown below has a tightly fitting press-on lid, with a fine-mesh insert at the centre. It is filled with syrup (4.5 litres) and inverted over a feed hole in the top cover of the hive.

The pail shown is sold by:  
A.I. ROOT COMPANY  
P.O. Box 706  
623 W. Liberty Street  
Medina, OH 44258  
U.S.A.

Many beekeepers use, instead of a special feeder, an inverted friction-top metal honey tin/can/pail that holds 2kg or 5kg of syrup, and these can be purchased from almost any beekeeping equipment supplier. Two or three holes are punched at the centre of the lid, using a nail (jagged side inside the pail). More holes can be used, but if they extend all over the lid, the syrup is liable to leak out when the can is inverted over the colony.



## DEVICES FOR SECURING HIVES FOR TRANSPORT

Frame hives are often transported by truck from one honey flow to another. It is essential that all hive boxes, and cover and floorboard, are fastened together so that they do not slip apart and let bees escape. Ventilation for the bees is also essential, and the lid of the hive is usually replaced by a perforated metal screen. The drawing shows two types of buckles for rayon/nylon straps to put round the hive; styles sold by general suppliers vary from country to country.

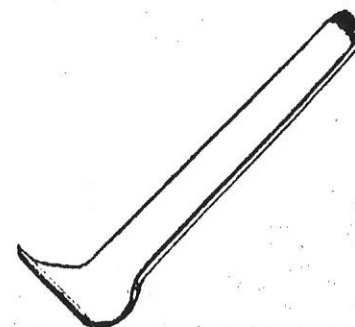
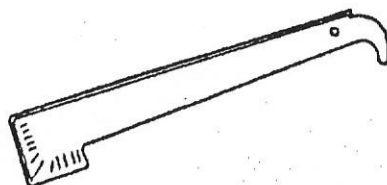
Apart from tightly secured straps, various metal devices are sold for permanent fitting to the hive boxes, with a closure to be applied before moving which locks the hive together; not all are suitable for large-scale operation. Large metal pointed staples are sometimes knocked into the boxes, but they cause damage and are not recommended.

Available from:  
**GENERAL SUPPLIERS**

## HIVE TOOL

The name 'hive tool' is given to a strong metal bar (usually of high quality spring steel) about 20-25cm long, which is shaped at the two ends in special ways. One end, often bent at right angles to the bar itself, is broad and with a sharp edge; it is used for scraping wax or propolis (a sticky resin bees use as a building material) off a wooden surface. For good leverage in loosening e.g. frames or top-bars, the other end is made narrower, or it may be specially shaped, for instance as shown in the upper drawing. A hive tool is useful for separating hive boxes, and is kept constantly at hand when inspecting hives. Any general beekeeping supplier sells hive tools, and it is worth trying several in your hand to see which suits you. The two on the left are made by:

**MAXANT INDUSTRIES INC.**  
P.O. Box 454  
Ayer, MA 01432  
U.S.A.



# Foundation and comb

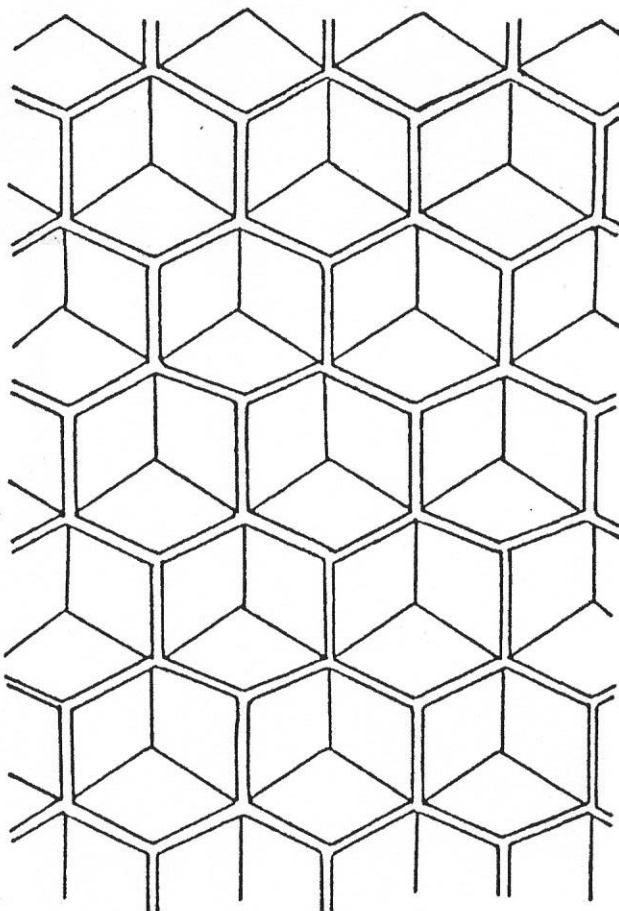
## FOUNDATION AND COMB

This section covers both comb foundation and the equipment for making it. The cell size is critical for both foundation and comb, so different types of bees are dealt with separately.

Foundation is made of beeswax. A

mixture of other waxes presents problems when combs are finally melted down and the beeswax recovered. For the use of plastics, see plastic frames (below right).

The diagram below shows (enlarged) the pattern of hexagons pressed into a flat sheet of beeswax when it is made into comb foundation.



## BEESWAX FOUNDATION FOR EUROPEAN 'APIS MELLIFERA'

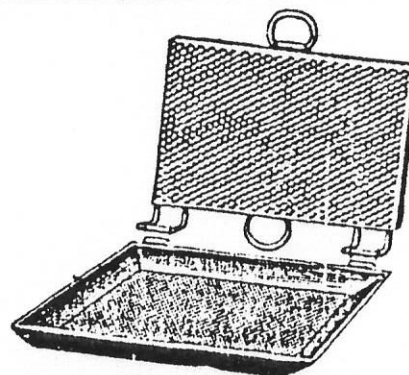
This is obtainable from almost any general beekeeping supplier where *Apis mellifera* is used. In North America most foundation is sold with strengthening wires embedded in it; elsewhere some beekeepers embed the wires themselves, securing them to the frame in the process. In Asia, both worker and drone foundation is manufactured by:

**IMELDA'S BEEKEEPER SUPPLIES**  
1910 F. Tirona Benitez Street  
Malate, Manila  
PHILIPPINES

## FOUNDATION DIES

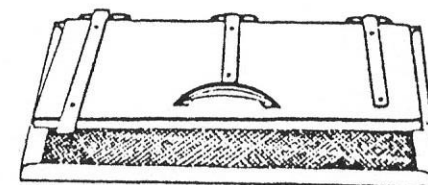
These provide the least expensive way of making foundation on a small scale. Molten beeswax is poured into a 'forming tray' to form a thin sheet, and the sheet is laid between a pair of matched dies (plastic sheets embossed with the hexagon shape of cell bases, shown on the left). The 'sandwich' is passed through a wringer or under a heavy roller. Alternatively, an oil drum filled with wet sand, or sand and water, can be rolled over the 'sandwich' which has been laid carefully on a flat board. The hinged plastic dies are sold in two sizes, 28 x 43cm for Dadant frames and 23 x 43cm for others, with cell size for worker or drone. The tray is manufactured by:

**H.T. HERRING & SON**  
14 Severn Gardens, East Oakley  
Basingstoke, Hants. RG23 7AT  
U.K.



## MOULD FOR MAKING EUROPEAN 'APIS MELLIFERA' FOUNDATION

The mould for making European *Apis mellifera* foundation is heavier than the embossed plastic dies (see above) but is more straightforward to use. Molten beeswax is poured onto the lower die,



which constitutes the base of the tray, and the hinged lid (upper die) is closed on to it. One manufacturer of such a mould is:

**LEAF PRODUCTS**  
24 Acton Road, Long Eaton  
Nottingham NG10 1FR  
U.K.

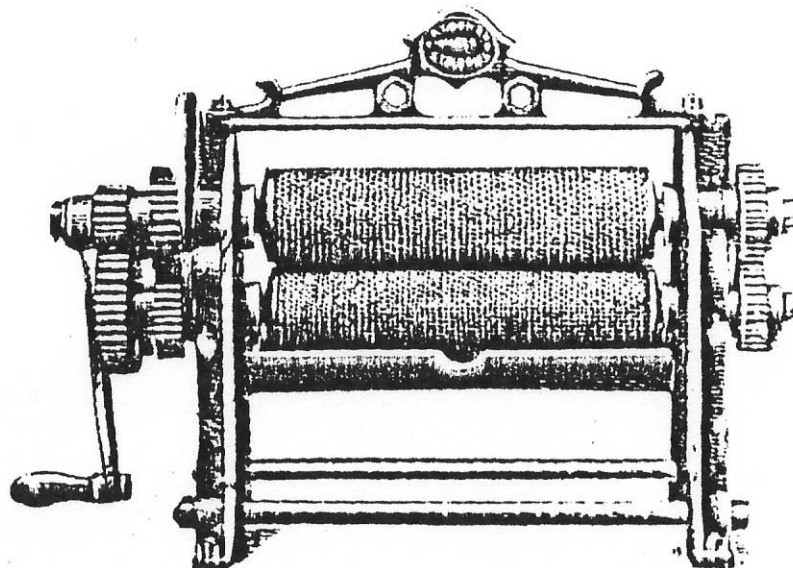
## ROLLERS FOR MAKING EUROPEAN 'APIS MELLIFERA' FOUNDATION

A previously formed long strip of beeswax sheet is passed between two rollers embossed to serve as dies for the foundation. (The long strip has been obtained by using a pair of plain rollers).

Three suppliers are:  
**ROGER DELON**  
83 Route de Grand-Charmont  
25200 Montbéliard, (Doubs)  
FRANCE

**CHR. GRAZE KG.**  
Strümpfelbacherstraße 21  
7056 Weinstadt 2, (Endersbach)  
W. GERMANY

**BERNHARD RIETSCH**  
Bienengerätefabrik  
7616 Biberach/Baden  
W. GERMANY



## PLASTIC FRAMES WITH INTEGRAL COMB (FOR 'APIS MELLIFERA')

Many plastic frames with integral plastic foundation (or alternatively comb) are produced. They are suitable for large-scale beekeepers, and benefits include greater strength when extracting honey at high speed, ease of sterilization, and saving of time used in assembling wooden frames.

In many conditions bees seem to prefer beeswax to plastic in comb or foundation, when both are used. If plastic is tried, it should be during a good honey flow, and all frames in a super should be plastic. Frames used successfully, with integral foundation on which the bees build combs are Pierce Plastic Frames, made by;

**PIERCO INC.**  
1495 W. 9th Building  
501 Upland, CA 91786  
U.S.A.

## BEESWAX FOUNDATION FOR TROPICAL AFRICAN 'APIS MELLIFERA'

The cell size for these bees is quoted as 1050 cells/sq dm. The following firm is believed to supply suitable foundation to this specification:

**JOHN RAU & COMPANY (PVT.) LTD.**  
2 Moffat Street  
P.O. Box 2893, Harare  
ZIMBABWE

**FOUNDATION MOULD**  
Manufactured by:  
**LEAF PRODUCTS**  
24 Acton Road, Long Eaton  
Nottingham NG10 1FR  
U.K.

**FOUNDATION ROLLERS**  
Manufactured by:  
**TOM INDUSTRIES**  
P.O. Box 800  
El Cajon, CA 92022  
U.S.A.

## BEESWAX FOUNDATION FOR 'APIS CERANA'

The following firms are believed to supply suitable foundation:

**IMELDA'S BEEKEEPER SUPPLIES**  
1910 F. Tirona Benitez Street  
Malate, Manila  
PHILIPPINES

**RAWAT APIARIES (Himalayas)**  
Ranikhet, Dist. Almora, UP  
INDIA

## FOUNDATION DIES

No foundation dies or moulds are known to be on sale. Matched dies like those for *Apis mellifera* (see above) would help many beekeepers in Asia. The initial production of the form from which dies are made is very expensive, and the manufacturer would need either to be assured of a large number of orders, or to receive some financial support, before he or she could produce these dies.

**FOUNDATION ROLLERS**  
Manufactured by:  
**TOM INDUSTRIES**  
P.O. Box 800  
El Cajon, CA 92022  
U.S.A.

## BEESWAX FOUNDATION FOR 'APIS FLOREA'

The firm below made (to order) rollers for *Apis florea* foundation, to fit their own foundation mill. They also supplied wax-melting tanks, and rollers for making the preliminary wax sheets.

**LOTLIKAR AND SONS**  
A-1/4 Pioneer Co-op Society  
Panvel 410206, Kulaba M.S.  
INDIA

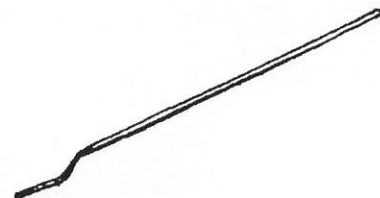


# Queen rearing

## QUEEN REARING

Queen rearing can be a profitable undertaking, both in financial terms and in improvement of colony performance and ease of handling. It must be done to a strict pre-planned timetable. Since queens mate in the air, no control over the male line is possible, except in isolated mating apiaries, or by using instrumental insemination. All equipment here is for European *Apis mellifera*, but most could be used or adapted for other bees.

One specialist firm is:  
**CHRISTIAN NICOT**  
Maisod, 39260 Molrans-en-Montaigne  
FRANCE

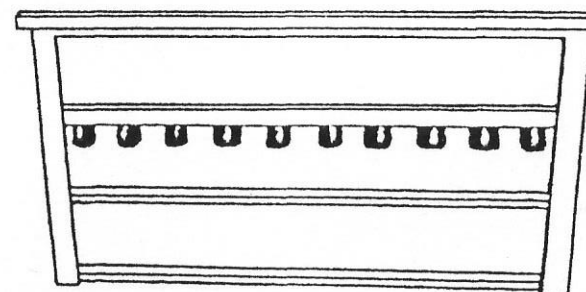


## GRAFTING TOOL

For transferring a young larva into a cell cup (see right), operators may use something to hand, for instance a pointed piece of yucca or other leaf. Alternatively they may prefer a specially shaped blunt 'needle' with a handle that allows them to work comfortably but with care and precision.

Grafting requires patience, good eyesight, and steady hands, but no booklearning.

Available from:  
**GENERAL SUPPLIERS**

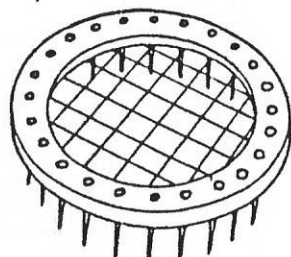


## CELL CUPS AND FRAME

The larvae are grafted (see tool left) into artificial 'cell cups' (right) with a supply of royal jelly, and the cups are often mounted on 3 horizontal bars fixed between the end bars of a frame which contains no foundation, 10 to each. The frame is inserted in a strong queenless colony of bees.



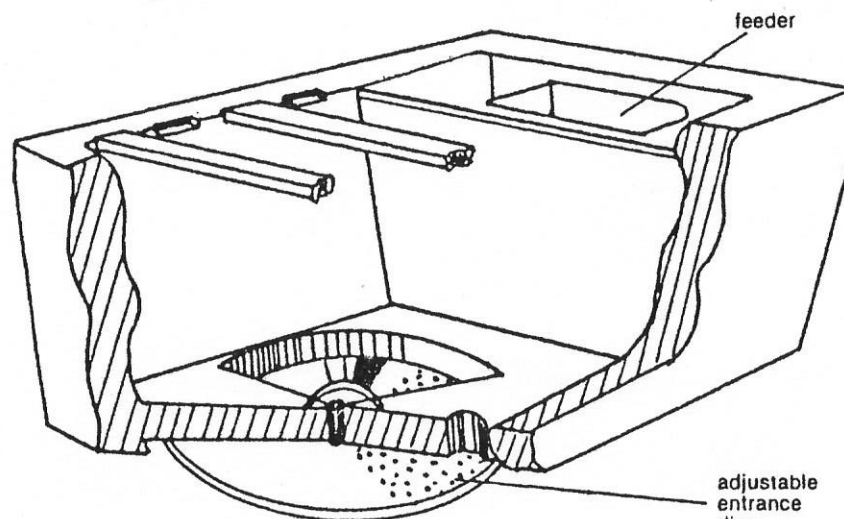
**GENERAL SUPPLIERS**



## QUEEN MARKING

A queen bee may be marked for identification by gently placing the fine threads of a press-in cage over her on the comb. A spot of quick-drying paint is then placed on the queen's thorax. Or tiny coloured discs may be stuck on; these are either numbered, or are made in the 5 colours of the international code for queen marking.

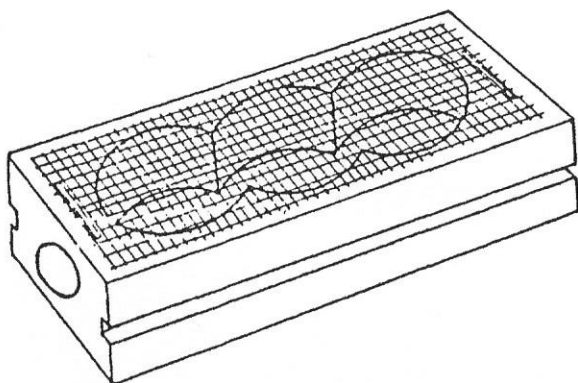
Available from:  
**GENERAL SUPPLIERS**



## MATING HIVE

After the queen cells are sealed, each is put into a small mating hive. The queen will shortly emerge and fly out to mate with drones in the air when a few days old. The mating hive can be like part of a brood box, containing 2 or 3 frames. Or it can be a tiny hive (as illustrated) which uses fewer bees. Queens are likely to mate more quickly from a small hive. Such hives are often of polystyrene, which provides better heat insulation than wood. They contain 4 top-bars from which the bees build sufficient comb to allow the queen to start laying. A feeder is provided. The model shown is fitted with an adjustable entrance at the bottom, and may be suspended for safety. Mating hives can be purchased from many suppliers; illustrated is that from:

**R. STEELE AND BRODIE**  
Stevens Drove, Houghton  
Stockbridge, Hants SO20 6LP  
U.K.

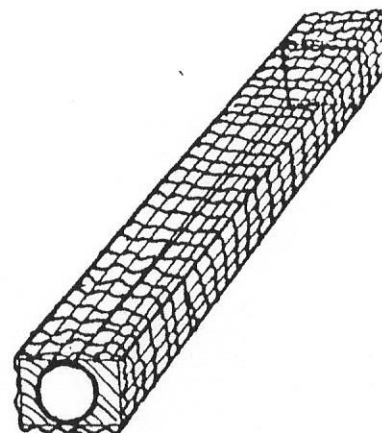


### QUEEN MAILING CAGE

The queen rearer uses this type of cage for sending queens to the purchasers. The cages are made by drilling into a small solid block of wood, and one hole

is filled with candy to provide food for the queen and attendant workers in transit. One side of the cage is of wire mesh to allow ventilation.

Available from:  
**GENERAL SUPPLIERS**



### INTRODUCING CAGE

The introducing cage is thin, to be slipped into the space between two frames. Dimensions of the cage shown are 89 x 19 x 13mm; the wire gauze leaves holes about 3mm across. These are as wide as possible because workers of the new colony must have direct physical contact with the queen in the cage, so that pheromones\* can pass between them. It is then more certain that she will be accepted by the colony. The queen is inserted into this cage without food, and the bees feed her through the gauze. In some types of cage the mesh is too small. (The workers that travelled with her are removed and killed beforehand; they can be of no benefit, and might possibly carry a new disease infection into the colony.)

\*Substance produced by insects and animals for detection and response by others of same species.

Available from:  
**GENERAL SUPPLIERS**

### APPARATUS FOR INSTRUMENTAL INSEMINATION

Methods for insemination of the queen with drone semen have been so well developed that they are now routine in some countries. But the apparatus required is expensive, and it is a waste of time and money to purchase it unless (a) a properly controlled selection programme can be used for bee breeding, and (b) it will be more beneficial to use instrumentally inseminated queens than naturally mated ones. The apparatus is not sold by many general beekeepers' suppliers, but the first address listed is one of the few that does and they also sell an excellent set of 111 full-colour 35mm slides with a printed manual based on them, taking the operator through every stage of the process.

**DADANT AND SONS INC.**  
Hamilton, IL 62341  
U.S.A.

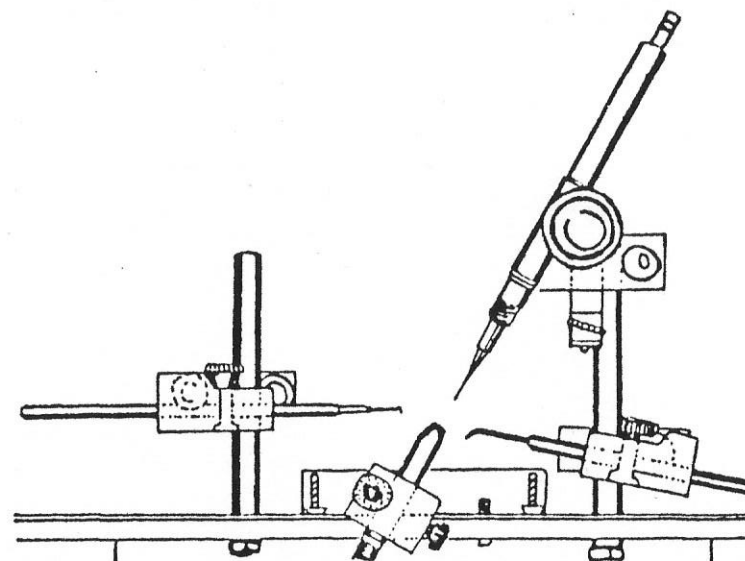
**APISMAR**  
Calle 40 no.492  
La Plata, B.A.  
ARGENTINA

**CHIRANA, EXPORT-IMPORT**  
92175 Piestany  
CZECHOSLOVAKIA

**J. HAIDINGER**  
Finkenweg 5, 8042 Schleissheim  
W. GERMANY

**HESSISCHE LANDESANSTALT FÜR LEISTUNGSPRÜFUNG**  
Aussenstelle für Bienenzucht  
Erlenstraße 9, 3575 Kirchhain  
W. GERMANY

**W. SEIP**  
Hauptstraße 34-36  
6308 Butzbach-Ebersgöns  
W. GERMANY



# Harvesting and processing honey

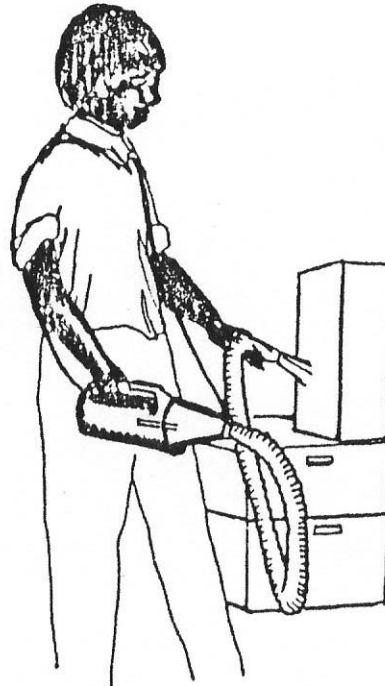
## REMOVING HONEY FROM THE HIVE

The bees must first be made to leave the honey supers. This can be achieved by brushing and shaking them off the individual combs, or by using an 'escape board' (see Hive Fittings, p.223). Alternatively the bees can be driven from the supers down into the brood chamber by using a 'fume board' to apply a bee repellent, or the supers can be taken off the hive and the bees blown out with a 'bee blower'.

An escape board involves two visits to the hive, one to insert it and another to check that the supers are bee-free, and then to remove them. The other methods need only one visit, but they disturb the bees more. It is therefore best to work late in the day, when flight activity is decreasing, to reduce the chance of subsequent robbing of honey by bees from other hives. If robbing seems to be occurring, it can be helpful to apply a fine spray of water to the hive fronts, or wherever bees are congregating — by reducing the temperature this makes the bees less active.

## FUME BOARD

This is a shallow box or tray made of insulating board such as pressed fibre — of the same cross-section as the hive. The internal depth of the tray is important and depends on the volatility of the repellent sprinkled on it. At temperatures above 27°C an insulated cover is helpful, to prevent heat from the sun vaporizing too much of the repellent. For benzaldehyde (artificial oil of almonds) a depth of 5cm has been recommended. After sprinkling benzaldehyde on the inside of the fume board, this is inverted over the (uncovered) top super; a white cloth on top of the board will prevent too rapid evaporation. After a few minutes the bees should have left the top (shallow) super; benzaldehyde is not effective with a full-depth hive box. The super is then removed, and if necessary the fume board is placed similarly on the one below, and so on.



## BEE BLOWER

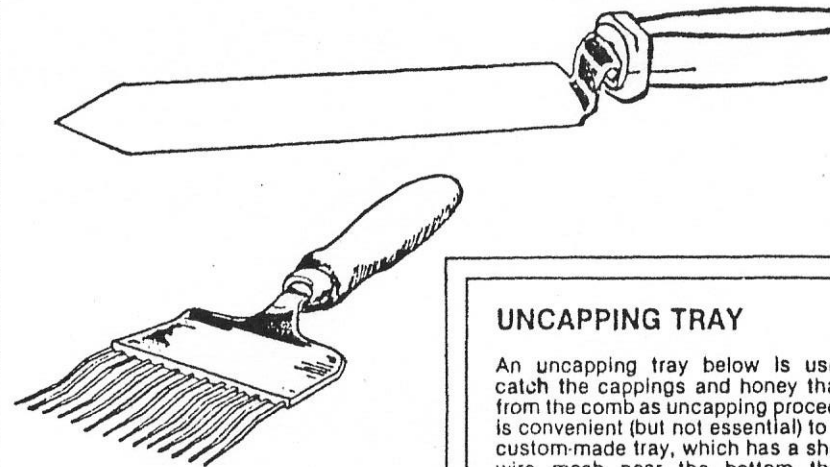
Unlike smoke or a bee repellent, an airstream used to blow bees out of a hive does not introduce any possibility of honey contamination.

A bee blower is normally powered from an electricity supply, but one could be devised to be operated by some other form of power. It is rather like a vacuum cleaner in reverse, and is used by standing a super (open above and below) either on top of the hive (as shown) or on a stand constructed like a sawing horse, placed just in front of the hive. The bees blown out of the super find their way back to the hive entrance. The blower shown operates on 110V, and is made by a specialist firm:

**SOUTHWESTERN OHIO HIVE PARTS CO.**  
Monroe, 629 Lebanon Street  
OH 45050  
U.S.A.

## UNCAPPING HONEY COMBS

Framed combs of honey taken from the hive must be uncapped (to remove the wax seals) before they are put in an extractor (see below).



## UNCAPPING FORK

These are of various widths, and many of them are narrower than the depth of a comb. They are operated by sliding the fork under the cappings from one end of the comb to the other. The narrow forks are useful when the shape or surface of the comb is irregular. The fork in the drawing (above), with offset tines, is made by:

**BLOSSOMTIME**  
P.O. Box 1015  
Tempe, AZ 85281  
U.S.A.

## UNCAPPING KNIFE

The knife shown here is of a standard type. The essential features are (a) that the knife is longer than the depth of the frame, and (b) that the handle is offset for convenience in use. The knife can be heated by standing it in hot water. Often two knives are used, one being heated while the other is used.

Available from:

**GENERAL SUPPLIERS**

## UNCAPPING TRAY

An uncapping tray below is used to catch the cappings and honey that fall from the comb as uncapping proceeds. It is convenient (but not essential) to use a custom-made tray, which has a sheet of wire mesh near the bottom through which the cappings drain. The frame is held firm by an upward pointing projection on the cross bar. General suppliers sell various types of uncapping tray, some with additional features, which suit individual preferences.

Available from:

**GENERAL SUPPLIERS**



## FUME BOARD (cont.)

If many supers are to be removed from a heavily populated hive (and especially if some of the honey is unsealed), increasing difficulty may be encountered with successive supers, since more and more bees are being crowded into a smaller space. (One commonly held objection to the use of any repellent is possible contamination of the honey, but this applies much less to benzaldehyde, which is used as a food flavouring, than to carbolic acid which was used earlier as a bee repellent.)

Available from:  
**GENERAL SUPPLIERS**

## HONEY PROCESSING

All previous operations have been on bees or hives. When starting to do work on honey, it is important to remember that honey is a food, and that appropriate standards of hygiene must be maintained. Also, bees not only make honey; they quickly get the scent of any honey left unguarded, and collect it to take back to their hives. This can happen in an astonishingly short time. So from the moment the honey combs free from bees are taken off the hive, they must be in a bee-tight building or enclosure.

Uncapping and extracting (by whatever method) must be done in a room that allows no access to bees. A few bees may be brought in on clothes or on combs, so vents that allow bees to fly out of the room but not to re-enter are helpful. There is one exception to the above rule: If a good honey flow is still in progress, the bees may continue to work it and ignore the honey being dealt with.

Bees in the honey house are objectionable from a hygienic point of view, because when they fly round trying to escape, they release excreta on to walls and floor and this is unacceptable in a food-processing area.

In the simplest operation, pieces of honeycomb are placed in a cloth, which is hung up and left for the honey to drip out (this is 'run honey', the best), and then squeezed to force out as much as possible of the remaining honey.

## HONEY EXTRACTORS

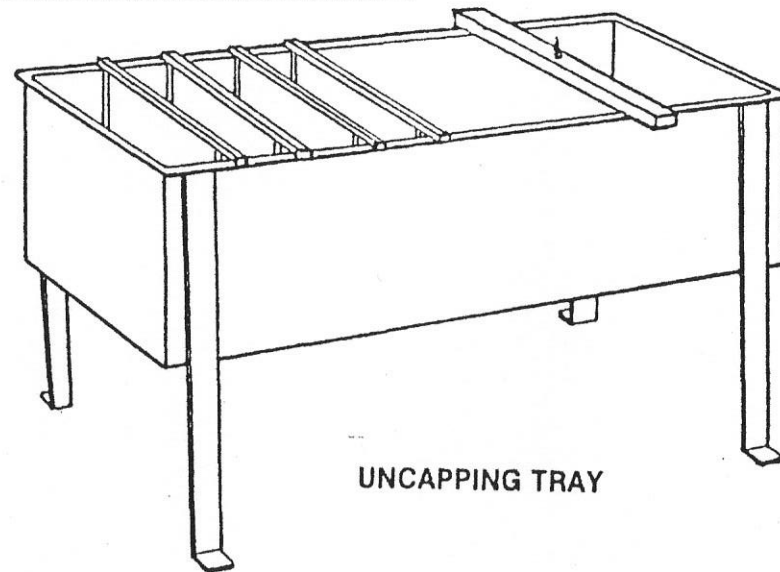
These operate by centrifuging the honey out of the combs. The extractor is a cylindrical container with a centrally-mounted fitting that supports combs or frames of uncapped honey, and a mechanism that rotates the fitting (and the combs) at speed. The honey is thrown out by centrifugal force to the inner wall of the extractor, whence it falls by gravity to the bottom. Very near the bottom a honey gate (see over) is fitted, allowing the honey to be drained out when required. A free space is left below the frames so that a certain amount of honey can accumulate, but honey must be drained off before it reaches the supports of the frames.

The temperature of the room is very important when extracting honey from the combs, because honey flows very much more quickly when warm than when cold, and less is left in the cells. Also, if high speeds have to be used to force the honey out, the combs are more liable to break. With very high-speed (electrically operated) extractors, the speed has to be increased gradually to prevent damage to combs.

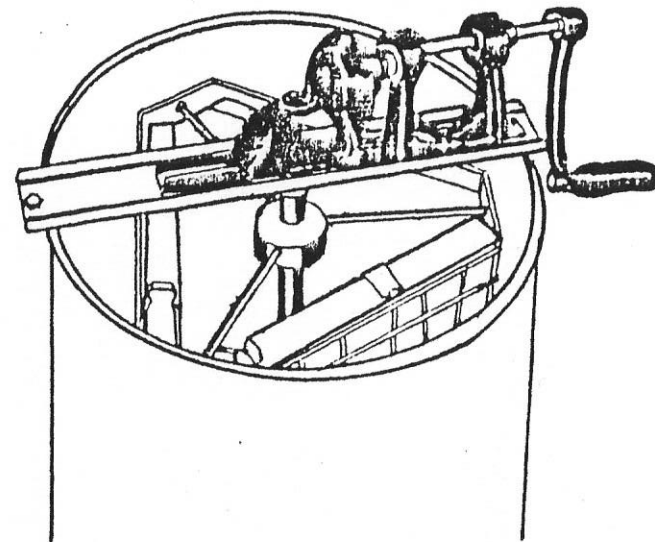
## TANGENTIAL EXTRACTOR

This was the first type to be developed, and is still much used, especially in small-scale beekeeping. The axis is vertical, and framed combs (often 2, 3 or 4) are supported in baskets, or against vertical grids, arranged tangentially, i.e. at right angles to the radius. The frames must normally be spun twice, once with each of the two sides outermost. Some tangential extractors are self-reversing. These extractors can be obtained from almost any general supplier. A firm that specializes in well made honey extractors is:

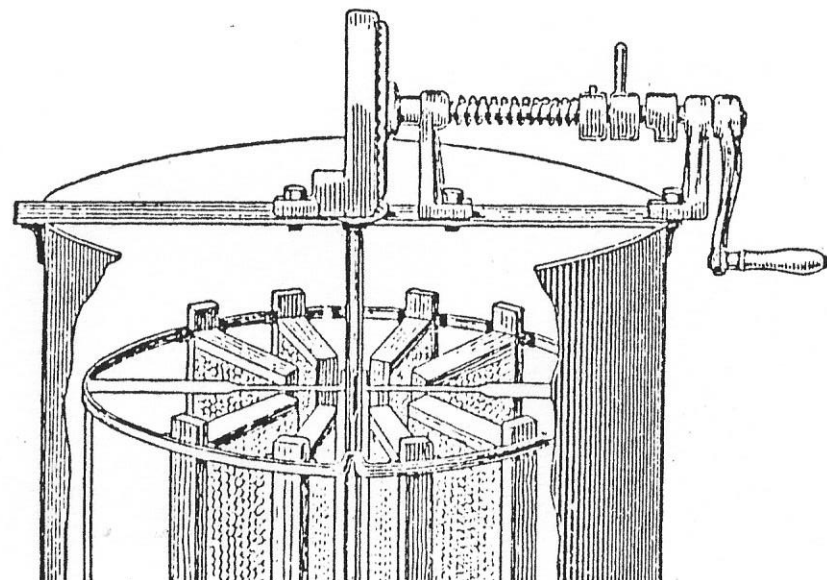
**MAXANT INDUSTRIES INC.**  
P.O. Box 454  
Ayer, MA 01432  
U.S.A.



UNCAPPING TRAY



# Processing honey



## RADIAL EXTRACTOR

A radial honey extractor is like a tangential one, except that the frames are placed radially. The cylinder is larger, and is often made to hold the frames from one honey super (9 or 10) or a multiple of this number. Frames are placed with the top-bar outwards. More power is needed to operate these extractors, and large ones are electrically operated, but a 9 or 10 frame extractor can be operated by hand, or by foot using an adapted bicycle mechanism. Only one spinning is needed.

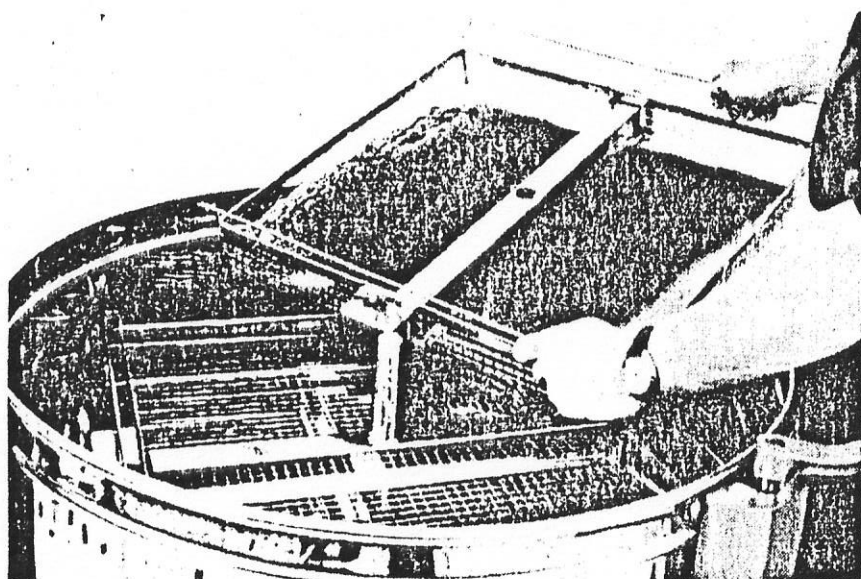
Available from:  
**GENERAL SUPPLIERS**

## HONEY GATE

Taps designed for water flow cannot be used for honey, which is very viscous and flows only slowly. Honey gates for fitting to extractors and tanks should be hygienic and easily cleaned; they should cut off the flow of honey instantly, with no drip, as soon as they are closed, and they must incorporate a safety device (often a screw) to prevent accidental opening from the closed position.

Honey gates are usually made of brass, stainless steel or plastic, and the diameter of the opening can range from 32mm to 76mm. Most large beekeeping suppliers sell them.

Available from:  
**GENERAL SUPPLIERS**



## EXTRACTOR FOR COMBS FROM TOP-BAR HIVES

These combs do not have the support of a full frame, or the strength of combs built on wired foundation. They cannot withstand the force of a normal extractor, but a small tangential extractor can be adapted by providing wire-mesh baskets in place of the usual grids. Unframed combs (or pieces of comb) are carefully placed in the baskets. The extractor must be spun twice, once with each side of the basket innermost.

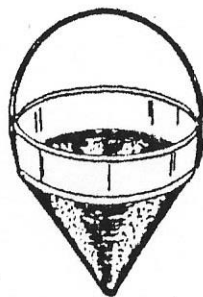
A larger extractor (illustrated), for combs from a top-bar hive, contains 6 pairs of baskets mounted horizontally, the whole taking 12 combs. Baskets are removed from the top, pair by pair, and combs inserted before they are replaced in the extractor. This extractor is wired for electric operation, but could be adapted for use without electricity. It is produced by:



**ETS THOMAS FILS SA**  
65 rue Abbé Georges Thomas  
BP No. 2, 45450 Fay-aux-Loges  
FRANCE

## HONEY STRAINERS

Commercially sold honey strainers are designed to take honey as it leaves the extractor, containing no more than small bits of wax from cappings. Modern quality requirements demand that final straining is through a very fine mesh, and this process is speeded up if all but the smallest particles have been removed first, by one or more strainers of larger mesh. As with other operations on honey, straining is faster if the honey is warm; honey flows roughly twice as fast for every rise of 10°C. Light and dark combs should be strained separately, since the flavour of the darker honey may not be as fine.

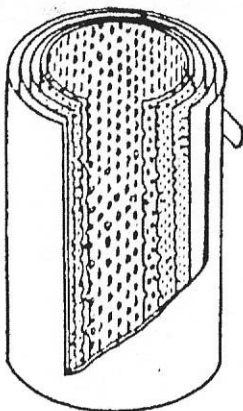
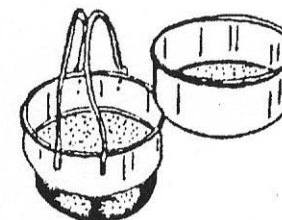


## SIMPLE HONEY STRAINER

The least expensive type of honey strainer is suspended from the honey gate of the extractor. On the left the honey is strained through a single cone of finely perforated metal. On the right an upper coarse wire mesh retains the larger particles, speeding up the flow through the lower fine wire cloth; below right these two strainers are shown separately. The strainers shown are sold by:

**E.H. THORNE (BEEHIVES) LTD**  
Wragby, Lincoln  
LN3 5LA  
U.K.

The above strainers are practical only for small amounts of honey. Somewhat similar strainers can be purchased with (or to fit at the top of) a polythene tank holding 70kg (see below).



*Dimensions in cm:*  
External diameter: 43  
Diameters of screens: 18, 23, 28, 33  
Height: 76  
Outlet diameter: 7.5

## OAC HONEY STRAINER

This well tried strainer for larger-scale operations was developed at Ontario Agricultural College (now the University of Guelph), in Canada. It consists of a cylindrical tank with a series of four cylindrical coaxial screens, one inside the other. From the centre, they have approx. 5, 12, 20, 30 mesh/cm. Honey enters the tank at the top, inside the innermost screen, with the largest mesh. It passes through the screens and is drawn off, also near the top. Each screen, and the tank, has a drainage gate at the bottom. This strainer has a large straining area for each mesh, and will handle 2 tonnes of honey a day at 30°C. In temperate climates, it can be operated successfully without heating the honey. The OAC strainer is sold by:

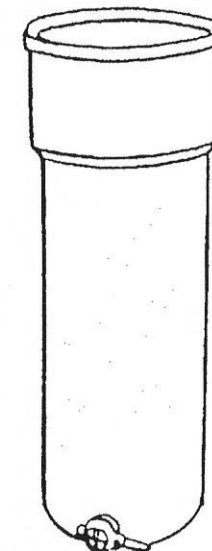
**F.W. JONES & SON LTD**  
44 Dutch Street  
Bedford, Quebec JOJ 1A0  
CANADA

## HONEY STRAINER AND SETTLING TANK

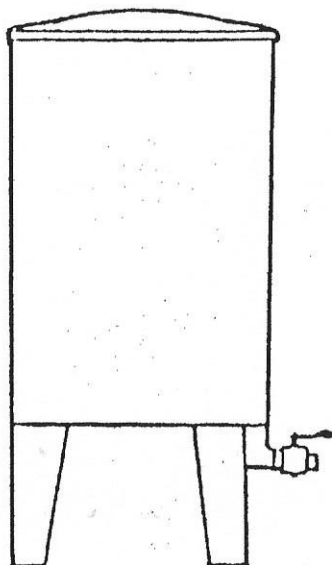
For small-scale operation, many beekeepers use a tank with two or more screens at the top, the upper one having the larger mesh. A honey gate (see above) is fitted near the bottom for removing honey, and the tank can be tilted for final draining. When honey stands in the tank, any remaining particles of beeswax rise to the top (hence the term 'settling' tank.)

Many general suppliers sell these tanks. The tank shown is made of polythene and holds 70kg of honey; it is sold by:

**E.H. THORNE (BEEHIVES) LTD**  
Wragby, Lincoln  
LN3 5LA  
U.K.



# Honey containers: harvesting pollen



## HONEY STORAGE TANKS

Containers in which honey is stored should be inert (giving no interaction between the vessel and the honey) and easy to clean. Honey is a food product, and it has a delicate flavour, and on both counts must not be stored in metal drums that cannot be cleaned, or that are scratched or damaged. Plastic and stainless steel are ideal materials for smaller and larger honey tanks, respectively. The containers must also be tightly closed and moisture resistant, or the honey in them will absorb moisture and may then ferment. The tank shown is made of stainless steel and holds 2 tonnes. It is provided with a stand since it is too heavy to be lifted for emptying. The base slopes down to the gate fitted at the lowest point.

A specialist manufacturer of these tanks is:

**MAXANT INDUSTRIES INC.**  
P.O. Box 454, Ayer, MA 01432  
U.S.A.

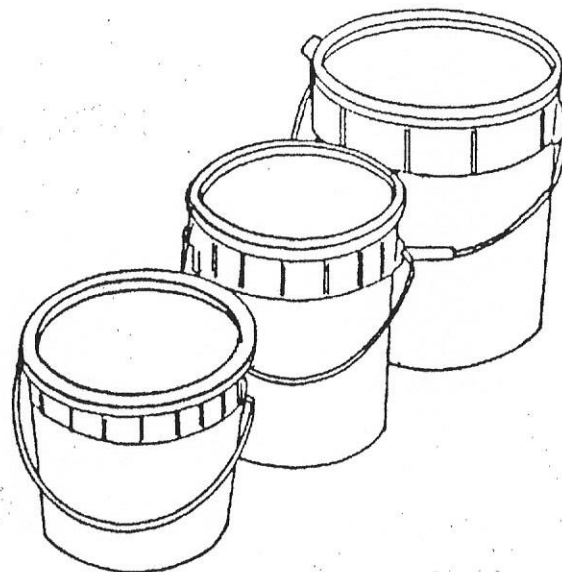
## HONEY CONTAINERS FOR MARKETING

As with honey storage tanks, the material must be inert and easily cleaned. Airtightness is essential, especially in humid climates, or the honey will absorb moisture from the air and will then be liable to ferment. Only plastic containers are described here; there is no chance of contamination as there is with metals (other than stainless steel). Glass jars are heavy, liable to break, and cannot be stacked one inside the other, so they are expensive to transport.

### LARGE POLYTHENE PAILS (2 to 30kg)

These usually have a reinforced rim, a press-on lid fitting tightly, and a wire handle. Those illustrated right are sold by:

**PRO-WESTERN PLASTICS LIMITED**  
150 Riel Drive, P.O. Box 261  
St. Albert, Alberta, T8N 1N3  
CANADA

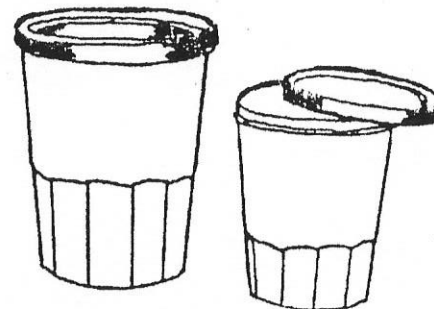


### SMALL PLASTIC POTS (0.5 to 2kg)

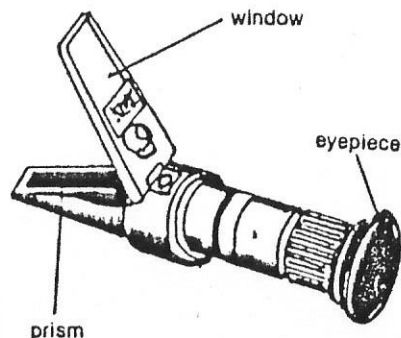
These have tightly fitting (re-usable) press-on lids. They may be tall or squat, opaque or transparent. For liquid honey, tall transparent pots are preferable, to minimize the chance of leakage and to show the honey off to advantage. For granulated (crystallized) honey, opaque pots are often used, because surface irregularities in crystal formation are then not visible.

Suppliers of tall pots (illustrated right) include:  
**SAF, s.n.c.**  
Via Liguria 17, 36015 Schio (VI)  
ITALY

Suppliers of squat opaque pots:  
**LILY CUPS DIVISION**  
P.O. Box 2195, Auckland  
NEW ZEALAND







## HONEY REFRACTOMETER

A refractometer measures the refractive index of a substance, and one calibrated

specifically for honey is very useful because the refractive index depends on the total percentage of sugars in the honey. The refractometer is usually calibrated directly in percentage of water (moisture). The upper limit in the proposed FAO/WHO Codex is 21 per cent, but most honey producers and traders would regard 18 per cent as a proper limit. Instructions are sent out with each refractometer, and they include a table of temperature corrections, since the refractive index is substantially affected by temperature. Some refractometers are calibrated in degrees Brix (a form of measurement of the sugar content in a substance).

In operation, a few drops of honey are placed on the prism (left of drawing), and the hinged window closed down on them, spreading them into a very thin 'sandwich'. On viewing through the eyepiece (right of drawing) against a good light, the scale will be seen, with an indicating line showing the reading. Since so little honey is used, it is most important that it is representative of the sample, and that the glass surfaces are

completely dry. Some refractometers incorporate a thermometer. The following firms supply honey refractometers:

**BEEMAID**  
625 Roseberry Street  
Winnipeg, Manitoba R3H 0T4  
CANADA

**A. ECROYD AND SON LTD**  
P.O. Box 5055  
25 Sawyers Arms Road  
Papamuri, Christchurch S5.  
NEW ZEALAND

**GIFU YOHO CO LTD**  
Kano-Sakurada-cho 1  
Gifu-Shi, Gifu 500-91  
JAPAN

**STEFAN PUFF GmbH**  
Neuhofdaugasse, 8011 Graz  
AUSTRIA

**SOPELEM**  
102 rue Cheptal  
92306 Levallois, Perret  
FRANCE

## PFUND COLOR GRADER

This instrument is used in the world honey market for measuring the 'colour' (darkness) of honey; it compares the opacity of a honey sample with that of a standard 'amber' liquid. The honey sample is placed in a wedge-shaped trough which is moved past a narrow slit in the housing until a colour match is obtained, i.e. the colour density of the honey matches that of the amber wedge. The reading on a millimetre scale is then the 'Pfund scale' reading for the honey, which corresponds to one of the following standardized colour names in the USA (in Canada and Australia the definitions are slightly different): up to 8mm water white; up to 16mm extra white; up to 34mm white; up to 50mm extra light amber; up to 85mm light amber; up to 114mm amber; over 114mm dark amber. Available from:

**XPORT**  
Port Authority Trading Company  
1 World Trade Center, 55NE  
New York, NY 10048, U.S.A.

## POLLEN TRAP

Honey and beeswax are the most commonly harvested hive products. Pollen, compared with honey, has a high protein, vitamin and mineral content, and in some countries is harvested and processed for sale. Harvesting is done by using a pollen trap, a device incorporating a hive entrance in which incoming bees must pass through two parallel grids of suitable mesh, with the result that pollen loads in the bees' hind legs are knocked off and fall into a collecting tray below. It would be dangerous to prevent any pollen entering the hive for more than a day or two, because brood rearing would cease, but use of traps is organised to prevent this.

Most pollen traps on sale are fitted at the bottom of a hive (and must have the same cross-section), either immediately above the normal floorboard or instead of it. Other designs are used at the front of the hive or at the top, with an upper hive entrance. Commercially available pollen traps do not necessarily fulfil all

the conditions for successful use under all conditions without harm to the colony. International Bee Research Association Publication M86, *Pollen and its harvesting*, explains the problems and gives recommended designs not on sale.

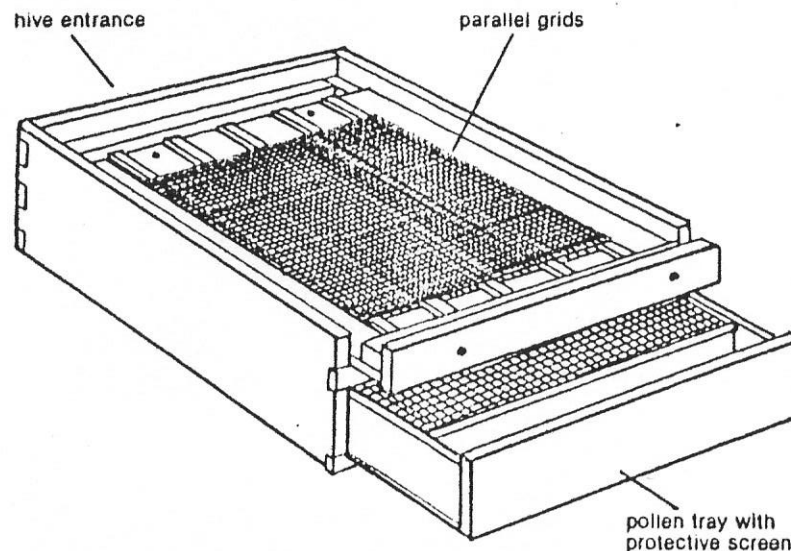
Pollen is a highly nutritious food, and therefore a good medium for the growth of micro-organisms. For this reason pollen traders in technologically advanced countries may be unwilling to import pollen from untried sources.

The pollen trap shown is sold by:

**HONEYBEE PRODUCTS**  
Amery, WI 54001  
U.S.A.

Another supplier is:

**KOREA BEEKEEPING APIARY**  
1155-1, Soong In-Dong  
Chongro-Ku, Seoul  
KOREA



# Processing beeswax: harvesting propolis

## BEESWAX PROCESSING EQUIPMENT

Beeswax is a valuable hive product, and should bring the beekeeper an added income. Unlike honey, it needs no container, and no special care in even long storage. In spite of this it is all too often thrown away. Beeswax has traditionally been exported from tropical countries. There may be little or no local use for it, and a beekeepers' co-operative or similar body may be needed to organize its sale to beeswax traders. When beeswax cappings, combs, etc. have been washed free from honey, or have been cleaned by bees, the beeswax is melted to let everything that is not pure beeswax separate out by sinking to the bottom. It is essential that light combs should be treated separately from dark ones, because light wax will fetch the highest price.

Beeswax *must* be heated in a safe way, or there is danger of a fire. The first

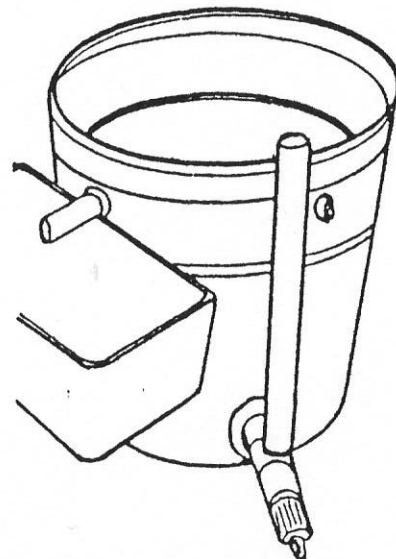
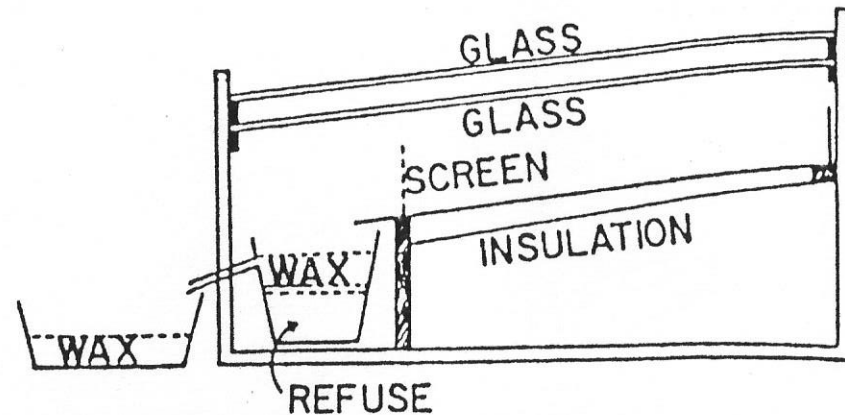
apparatus described is ideal in this way, costs nothing to operate, and can produce very high quality wax.

In some areas, traders may be suspicious that blocks of wax offered for sale have stones in them, to add to their weight; any such stones would not be visible. In such areas, it is best to make rather thin blocks, which could not hide stones.

## SOLAR WAX EXTRACTOR

The wax pieces are put on a metal base, closed in by four sides and a lid consisting of two sheets of glass 5mm apart; the whole is tilted at a suitable angle to catch the sun's rays. Below the base is an insulating layer to reflect the heat back. Heat is trapped inside the box, and melted wax runs down the sloping base (leaving most of the dross behind), and into a container within the box. A second external container can be incorporated, as in the drawing.

Available from:  
GENERAL SUPPLIERS



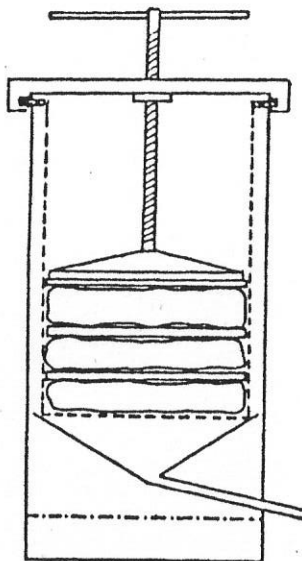
## HOT-WATER BEESWAX PROCESSOR

In principle this is a vessel in which water and unprocessed beeswax can be heated together and (a) the beeswax floats on the top and is drained off, leaving behind the dross and the dirty water; (b) more water can be added at the bottom, to raise the beeswax layer to the correct level for draining. The drawing shows a simple type produced by:

HONEY & BEE DIVISION, SHOTS INC.  
4418 Josephine Lane  
Robbinsdale, MN 55422  
U.S.A.

## MOUNTAIN GREY BEESWAX EXTRACTOR AND CLARIFIER





### STEAM BEESWAX PRESS

The type illustrated consists of a steamer fitted with a screw plunger. Steam generated from water at the bottom of the container reaches the combs wrapped in canvas bags through the perforated basket into which they are placed; the bags are separated by wooden boards. The cross-arm is locked in position so that the combs are under pressure, and the melted wax runs through the basket and out of the tube. When the wax flow ceases, further pressure is applied. It is necessary to turn the screw back and shake up the bags before renewing the pressure, to extract all the wax, which should be done in 2 or 3 operations, leaving only 1 to 3 per cent dross behind.

Several slightly different models are supplied, one fairly similar to the drawing by:

**STEFAN PUFF GmbH**  
Neuhofdaugasse, 8011 Graz  
AUSTRIA

### MOUNTAIN GREY BEESWAX EXTRACTOR AND CLARIFIER

This appliance gives much cleaner wax and is very satisfactory in operation. It can be used for clean combs or dirty wax, but will not extract all the wax from cocoons or pollen of brood combs. It melts the wax in water and strains it through a coarse cloth covering the top of the container.

The two-gallon steel container has a long funnel or filler tube leading from the bottom, the top of the funnel being well above the top of the container itself. Round the outside of the container is a collecting channel for the wax, that slopes to a spout. A straining cloth is fitted over the top of the container and is held in position by means of a wire clip. The container is one-third filled with clean water, either rain water or tap

water to which a little vinegar has been added (rather less than 1 per cent). The water is heated on a stove and the wax, previously soaked in water, is put into the container and the whole stirred until the wax is melted. Wax can be added until the surface comes to within 5-6cm from the top. When all the wax is completely melted, the appliance is taken off the stove and the straining cloth secured in position with the wire clip.

The wax floats to the top of the water, and more water is added through the funnel, which exerts enough pressure to force the wax through the cloth and into the collecting channel.

This extractor is obtainable from some British suppliers including:

**E.H. THORNE (BEEHIVES) LTD.**  
Beehive Works, Wragby  
Lincoln LN3 5LA  
U.K.

### PROPOLIS COLLECTOR

Bees gather a sticky resin known as propolis, from certain trees that produce it. They use it to close up gaps in their hive, or to reduce the hive entrance.

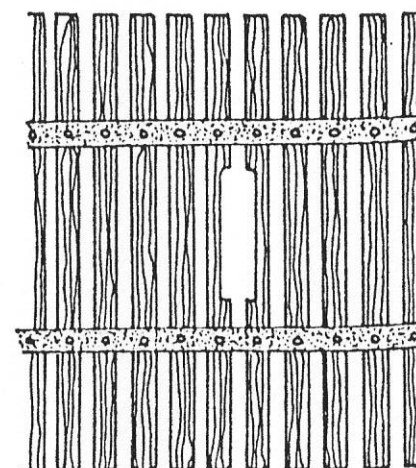
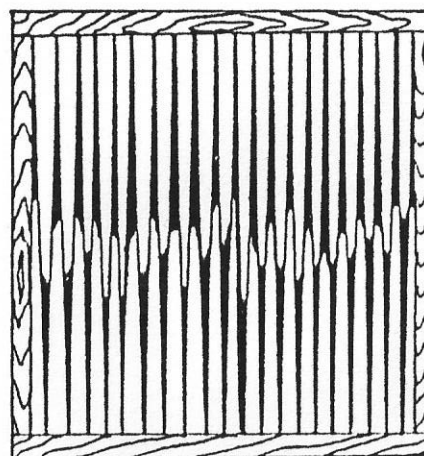
Propolis contains a number of antibiotic substances, derived from the plants on which the bees find it. Its use in the pharmaceutical industries of some countries is accepted. The demand for propolis, and therefore the price it fetches, vary greatly from year to year, so enquiries should be made before embarking on a programme to produce it. It is also wise to deal with an established trader: propolis is rather new as a commercial product, and therefore attracts new traders, some of whom are unable to continue. On the other hand (unlike pollen) it is relatively stable in storage. If the demand for it increases, it could provide a useful additional source of income.

The principles of harvesting are

simple. A flat sheet with slits (of a width that bees will close with propolis) is inserted at the top or at the side of the hive (where the bees will regard it as the outside wall of their nest). When the slits are well closed up with propolis the sheet is removed and placed in a deep freeze; the propolis is subsequently released from the sheet by shattering.

The only firm known to market a propolis collector for placing above the top hive super is:

**HUNGARONEKTÁR**  
Budapest 1054  
Garibaldi u.2  
HUNGARY



# TOOLS FOR AGRICULTURE

A buyer's guide to appropriate equipment

I.T. Publications *in association with*  
GTZ/GATE • 1985

## ABOUT THIS GUIDE

In 1965 the Intermediate Technology Development Group prepared its first guide to UK manufacturers of small-scale agricultural equipment and since then ITDG has regularly published 'Buyer's Guides'. *Tools for Agriculture*, the last edition of this guide, was published in 1976, and presented information on some 700 products manufactured by about 250 manufacturers worldwide.

This guide is intended to assist the prospective buyer in a rational choice of equipment. It presents a greater range of equipment, both in the numbers of manufacturers and countries covered and in terms of types of equipment, placing different emphasis on the kind of information presented. Whilst the coverage of equipment for pesticides application (for example) has been compressed, the coverage of livestock production equipment has been greatly expanded compared with previous editions. Furthermore, specific sections on Wool harvesting and Beekeeping were included after considering the range of livestock production activities which are most widespread and beneficial to lower income groups — these two were selected because the available range of equipment represents a suitable, intermediate, level of technology.

The process of compiling the guide started with requests being sent to a list of some 6,000 manufacturers, asking for information about their products. The response was disappointing and further letters were sent to a selected group of manufacturers.

Then, after careful investigation of secondary sources, additional product information was added to the data bank. Although by no means exhaustive, the guide will provide the reader with as much information as is reasonably available. Readers should understand that we have not necessarily included all the products available from the listed manufacturers.

*Patrick Mulvany, Agriculture Officer, ITDG  
Myson House, Railway Terrace,  
Rugby, CV21 3HT, UK*

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