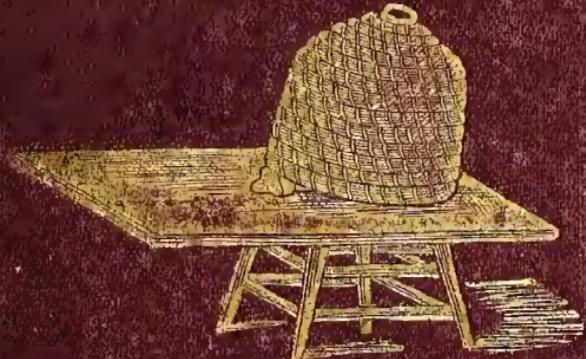


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Practical Bee-Keeping:

BEING

PLAIN INSTRUCTIONS TO THE AMATEUR FOR THE
SUCCESSFUL MANAGEMENT OF THE
HONEY BEE.

ILLUSTRATED.

REWRITTEN AND ENLARGED BY

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P R E F A C E .

WHILST it cannot be denied that bees may be, even profitably, kept by those miserably ignorant of their habits and necessities, it is also true that to achieve considerable success, and to make our bees our companions and the ministers of our pleasures, we must regard bee keeping as an art only to be acquired by attentive observation. This art can indeed be learned by some more readily than others, yet there are but few who, with a little care, patience, and painstaking, may not experience in a greater or less degree both the enjoyment and the profit that are to be found in the possession of a few prosperous hives. That knowledge and attention are of the highest moment in this matter is apparent from the fact that some will secure that gratification which comes from the successful prosecution of a hobby with not small profits into the bargain, in those very localities where the less instructed will realize little but the mortification of continued failure with balances persistently adhering to the wrong side of the ledger. The writer has known of cases where, with the same individual and the same set of hives, mourning has been turned into rejoicing when error and mismanagement have been displaced by intelligent instruction in correct methods of operation. Much progress has been made within the last few years, but even now it is true that bee keepers are the many, bee masters the few; and let us remember that there is no royal road into the ranks of the latter—which can be reached only by time, observation, and that natural aptitude which we call tact. We meet not unfrequently with glowing accounts of the charms of bee keeping, amongst which the money returns cut no inconsiderable figure. Stimulated by these the reader perchance purchases 2 or 3 stocks, places them in his garden, and after a year or two of comparative or total failure gives up his bees, if indeed any yet remain, as a delusion and a snare: a little proper instruction would have turned failures into successes and losses into gains. To supply such help is the object of the following pages, which the author now commits to his readers with the hope that their mission may be abundantly useful.

FRANK CHESHIRE.

Acton, W.

CHAPTER I.



NATURAL HISTORY OF THE BEE.

THE bee is an insect and as such passes through changes analogous to those of the silkworm or blow-fly. Every one knows that the former is produced from an egg laid by the moth, and that, after feeding voraciously, it spins about it a cocoon, in which it remains encased until it emerges a perfect insect; and that the egg of the latter produces the gentle, which turns into the brown *pupa* whence emerges the fly like to its parent. Taking these changes as parallel to those exhibited in the hive, we have a sort of key by which to remember them.

Honeycomb consists of cells of wax of two sizes, so placed that the hexagonal ends of twenty-seven of the smaller and nineteen of the larger cover a square inch of the surface of the comb on each side. These cells are not used by the bees as storehouses for their sweets alone, as each one may be utilized as a cradle in which the young may be nurtured and matured.

Each hive in a normal condition contains but one mother bee, commonly called the queen; who alone has the power of laying eggs, and consequently of producing young. The mass of the population receive the name of worker-bees, because upon them falls the labour of feeding the young, building comb, gathering honey, &c., while generally between the months of March and August, and abnormally at other times, there exists a larger or smaller number of drones or true males. These are distinguished at sight from the workers, which as we shall see presently are undeveloped females, by their rounder form and greater size, and also by their more noisy buzzing flight.

Let us note the history of a worker from the egg which is left by the mother bee or queen adherent at the end of the cell, and is of pearly whiteness, and long in proportion to its diameter. From this, after three days, a tiny grub emerges, upon which food is poured by the younger worker-bees, whilst performing the functions of nurses. This food, which has undergone digestion in the body of the nurse is absolute nourishment from which the refuse parts have been drained in her body. The grub rapidly grows, at first curling itself in the cell, then, as its body becomes more bulky, it advances its head, and on the sixth day after hatching com-

mences to surround itself with a whitish silky cocoon. The bees now enclose it by a covering of wax and pollen not impervious to the air, and in this condition it is said to be sealed. The creature, now in the quiet obscurity of its tomb-like chamber, begins to develop the more complex organization of the imago or perfect insect, and in twelve days bites its way out of its prison house, not only provided with organs of flight and locomotion, but fully equipped with those varied parts necessary to that circle of labour which has been traced out for it by the finger of the Creator. The drone is evolved from an egg deposited in one of the larger cells, and has a history similar to that of the worker, but twenty-five days instead of something less than twenty-one, are needed to produce the perfect insect.

Honeycomb when first built by the bees is of beautiful whiteness, but the operation of breeding in the cells soon stains it of a dark brown colour, because each bee leaves behind it the shroud in which it had enveloped itself.

The *modus operandi* of producing a queen is one of the most singular features in the economy of the hive. Any egg which would if treated as already described produce a worker, can by the bees, and at their will, be converted into a queen. The circumstances rendering a new queen necessary it would be premature here to explain, but these circumstances existing, the bees select either a few ordinary worker eggs or young worker grubs and build around them, commonly by the destruction of three contiguous cells, large cells not unlike acorns in form. (See illustration, in a subsequent chapter). The grubs are then fed in a peculiar manner upon a food known amongst bee keepers as "Royal-jelly," the exact origin of which as distinct from ordinary food for grubs is as yet quite a mystery. The result of this peculiar treatment is most remarkable. In sixteen days instead of twenty or twenty-one from the laying of the egg a queen emerges instead of a worker. *Id est*, a more perfect and fully developed creature (for a worker is an *undeveloped* female) is produced in one-third less time. It is capable of laying a prodigious number of eggs (in the breeding season often two thousand a day) whereas a worker is incapable normally of becoming a mother. The body is longer, its color lighter, its wings shorter than that of the worker, and unlike the latter its tongue is incapable of brushing up honey from flowers. It cannot secrete wax; it has no hollows in the legs for storing bee bread or pollen. In short, to the initiated the queen in head, in body, in legs, in sting, everywhere, is unlike the worker. Its instincts are entirely changed. It has no disposition to leave the hive for honey gathering. Its term of life is extended from a few months at most, to four or five years, and all this and much more is the result, so far as yet appears, of feeding. The function of the drone is to meet the young queen at her flight, which she usually takes when about seven or eight days old, when in two days more she becomes a mother.

CHAPTER II.

STRAW HIVES.

SKEPS—SIZE OF—SUPERS FOR—SUPERING HIVES—NEIGHBOUR'S
COTTAGE HIVE—FLOOR BOARDS FOR—PROTECTION OF.

HIVES are broadly divisible into two kinds, those in which the combs are fixed and those in which the combs can be removed singly and replaced at the will of the operator. The latter, called movable comb hives or frame hives, give ample scope for the best kind of management, and are undoubtedly in advance of those older forms with combs fixed. The common skep or straw hive has still its admirers and it cannot be fairly

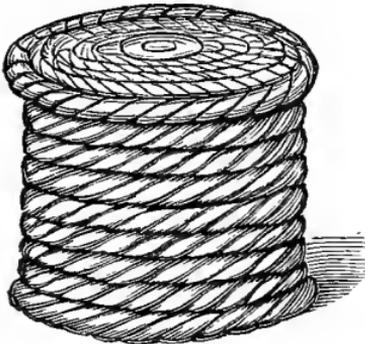


FIG. 1.

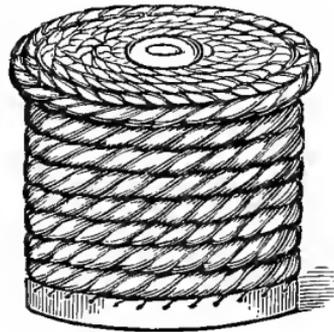


FIG. 2.

FLAT-TOPPED STRAW HIVES.

denied that it is both light, cheap, and handy for the bee keeper, and comfortable for the bees, while it demands but little skill for its manufacture, and is equal as a non-conductor of heat to the best wooden hives. The skep, as commonly seen in the cottager's garden, is dome shaped, but it is desirable that the top should be flat or flattish. It is not generally difficult to get our skeps made to order when they should not cost more than 2s. each and ought to be large enough to hold nearly a bushel of bees: *i.e.*, contain from 1800 to 2000 cubic inches.

A rough and ready rule for finding the contents of a round hive like a skep will be useful. Multiply the internal height by the internal diameter twice, and take three-fourths of the amount. For example, if the diameter be 16in. and the height 9in. $9 \times 16 \times 16 = 2304$ and three-fourths $2304 = 1728 =$ the cubic content.

Fig. 1 is a good shape, it is flat-topped, with a 3in. hole in the centre of the crown. Have the block for the centre hole turned out of a piece of $1\frac{1}{2}$ in. wood (Fig. 3). The straw will work better round it and fit more closely if the edge be grooved. Work rims on the top and bottom; the lower one will steady the hive on the bottom board; to the upper the super may be attached. The rim of wood which some persons work on the bottom of the skep does not add materially to the durability of the latter when properly protected from damp, while it certainly makes the interior less snug during winter.

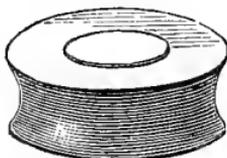


FIG. 3.

The super which is to receive the honey for the bee keeper may be of straw, and of the same diameter as the hive. Wire pins, (common hair pins will do capitally) passed through the straw in three or four different parts will effectually keep the super in its place. When first set up, mark the back part of the hive with a dab of paint; in this way,

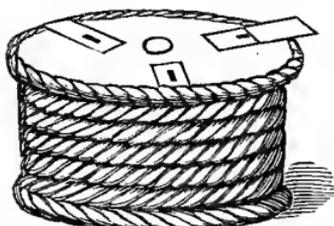


FIG. 4. STRAW SUPERING HIVE.

should the hive be moved for any purpose, it can be replaced accurately. The direction of the combs should not be altered, the bees preferring them to run from front to back, and not crosswise. Straw supers are complete in themselves, while those of wood or glass require covering in with some form of jacket to make them equal in all respects to their more humble competitors; but, if wood or glass be preferred for the super, then an adapting board, with 3in. centre hole, $\frac{1}{4}$ in. thick, must be fastened over the flat top, and pegged or screwed down, the interstices being filled with some luting, such as linseed-meal or clay. This board, to prevent warping, had better be made of mahogany or two pieces of pine one-eighth of an inch thick each, nailed and clenched together, with the grain running opposite ways.

If the crown be made of wood, it should not be less than 1in. in thickness, with three holes 2in. in diameter, with zinc slides running in grooves, as Fig. 4. The board can be best made to fit the straw work by tapering its edge and pressing it into place, and fixing by two or three nails. If more expense is not objected to, Neighbour's improved cottage hive

(Fig. 5), with glasses and top complete, may be bought for 35s. at Regent-street. Mr. Neighbour is making these hives larger now than formerly. This is a great improvement. It is highly probable that the introduction of so much foreign blood in the shape of imported queens has improved our race of bees, and that they now require for the full development of their powers greater space than was once sufficient.

It is very desirable that each hive should have its own stand:—houses containing the hives, for reasons it would be premature here to explain, are very undesirable. The stands give much greater facility for management if they are not fixed in the ground, as some recommend, but are of the nature of stools. If these stools are too high they are in danger of being blown over, if too low the hives get damp; about twelve or fourteen

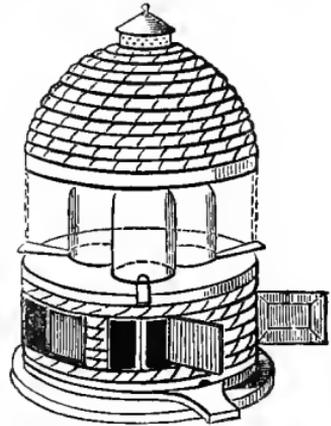


FIG. 5. NEIGHBOUR'S COTTAGE HIVE.

inches will be found suitable. The bottom board should be round and of the size of the hive, or, the parts lying beyond the hive's sides catching snow or rain, quickly wet the hive walls and make the bees wretched. In the neighbourhood of chair makers elm bottom boards can be had very cheap, but failing these, they may be made in deal of the form seen in Fig. 6; the projecting part, B, serving as an alighting board from which the bees start and upon which they settle as they return home laden. Most bee

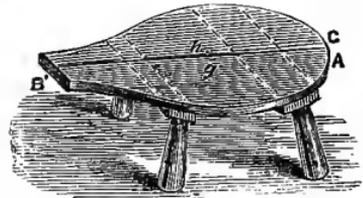


FIG. 6. HIVE STAND.

keepers decrease their outlay and increase their enjoyment of their hobby by what may be called apicultural carpentering, and so a good method

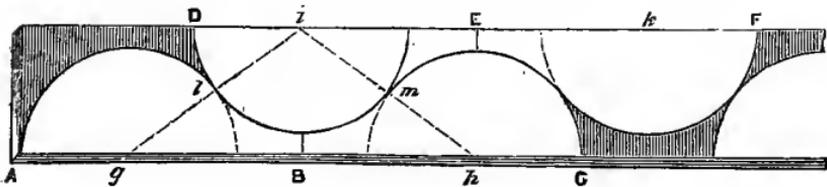


FIG. 7. PLAN FOR CUTTING FLOOR BOARDS.

of cutting out bottom boards is shown at Fig. 7, which represents the

plank. Mark at the end of it a semicircle whose radius $A g$ is half the outside diameter of the hive. If we have no compasses a piece of twine, a tack and a pencil will be sufficient. Now mark a point l in the semicircle in the centre of the width of the board and draw g, l, i . Draw the next semicircle, with i for centre, and continue as before. Now cut with a bow or key-hole saw through from A to l , then from l to m on second semi-circle and so on, then cut through B and E . Each pair of pieces will make a bottom board, A being brought to C , g to h , and the points at B remaining together as in Fig. 6. The shaded parts will supply the battens to fasten the halves together and give fixing for the legs. With this kind of bottom board an entrance must be cut for the bees into the hive side. Let this be made from three to four inches long,

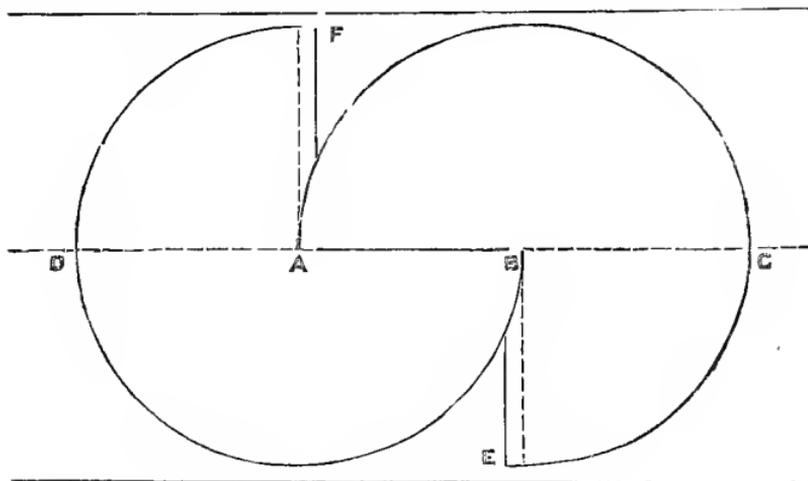


FIG. 8. PLAN FOR CUTTING COVERS.

and fix to it a sliding door so arranged that the opening may be, if desired, reduced to $\frac{1}{4}$ in. square.

Before the hive is ready to place in the position we intend it to occupy, it must be protected from the weather, as hives of sodden straw are about the most wretched with which bees can be provided. It could be wished that all skeps were too large to be covered by American cheese boxes, but this not being the fact, we will explain how these—which may be obtained for 3*d.*—may be made into capital rain tight protectors good for ten year's wear. The lid of the box placed on four inverted flower pots or some bricks, as Mr. Pagden suggests, will make a fairly good bottom board, while the box proper forms the case for the hive itself. Before being used the bottom of it (which will be the top of the hive-case), and one or two inches down the sides, should be painted well over with hot

pitch. A sheet of newspaper should now be evenly spread over it, when by the application of a hot iron used after the manner of the laundress, the pitch is remelted, and well incorporated both with the wood and the paper; all cracks are closed and the cover made absolutely rain proof. In winter, sacking, hay, straw, or fine shavings should be filled in between the hive and the box. This method of waterproofing will furnish a useful hint for treating covers for hives of other kinds, the carpentry of which may not be of the most finished description. Flat earthen pans (milk pans) are often used to roof skeps, but the largest of them are too small for skeps such as we recommend.

We have been very cordially thanked, by some straw hivists who have felt the insufficiency of milk pans, for suggesting the felt cover now described. (See Figs. 8 and 9.) Felt is sold for 8*d.* the yard run, and is 2ft. 8in. wide. It should be cut as shown in Fig. 8. Make a notch in a lath 17in. from its end, at one inch from which bore a hole with a bradawl, which stick 16in. from the end of the felt at B, and equally distant, that is 16in., from each edge. With chalk held in the notch in the lath run round the $\frac{3}{4}$ circle A C E; now place the awl at A and describe the $\frac{3}{4}$ circle B D F. Cut out the two covers through F A, B E. Draw their straight edges together until one edge touches the dotted line. Tack these two edges together into a thin lath and the cover is in form. The waste pieces of felt, which will be very small, will suffice for four straps to be fastened underneath by clenched nails and which may be tied to the hive by a string passing round it. This will effectually prevent the cover being blown away in the stiffest gales. Fig. 9 shows the cover complete; it will be 24in. in diameter, G H, and will afford, in consequence of its greater size, far better protection than a milk pan, while it costs only 5½*d.* Pitched and ironed or coated with tar and afterwards sprinkled with hot sand this cover will last many years.

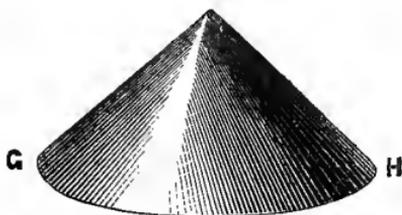


FIG. 9. FELT HIVE COVER.

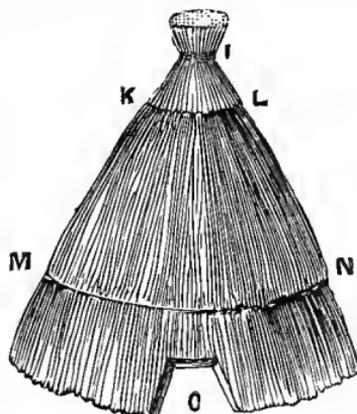


FIG. 10. RUSTIC HIVE COVER OR STRAW HACKLE.

No cover is more rustic, and at the same time more cosy in appearance, than the straw-hackle, while it is equally good for summer and winter.

its manufacture is by no means difficult. The straw having been well soaked as for thatching, and gathered up into a good sound bundle, in which all the stalks lie parallel, is securely tied with basket-makers' twigs or tarred string. Hoops are then fastened within at K L and M N. The hackles are now fitted over the form of the hive and left to dry, stiffen, and set. A wooden peg or two passed through the hackle above the hoop into the hive side will prevent the wind disturbing it.

We here point out that saving the cost of a thoroughly good hive-cover by substituting some inefficient makeshift, is but poor economy. If the straw domicile be completely screened from the insidious snow and driving rains of winter, the little inhabitants, if in health and fair numbers, will brave with but little injury the most severe cold of our climate; but in a skep boasting no better protection than some rotten rhubarb leaves, or saturated sack, honey is not only consumed in much increased quantities, but the effort needed to maintain the temperature within so far exhausts the vital energies of the bees, that they are unable to withstand the labour of brood-raising when spring returns, and then often die off even more rapidly than young bees are produced. "Why this spring-dwindling?" is the inquiry. "Why are my bees diminishing in numbers just as everything is appearing to favour returning activity and prosperity?" The reply should not unfrequently be "bad wintering." Even if the results are not fatal they are damaging, and hives neglected in the particulars just mentioned swarm later, and are consequently profitless in comparison with what they might have been with careful management.

CHAPTER III.



BAR FRAME HIVES.

THE WOODBURY—THE ABBOTT COTTAGE—THE CHESHIRE—THE
SHERRINGTON—THE ABBOTT—THE CARR STEWARTON.

IN a short treatise like the present one, a history of the bar frame hive would oblige the omission of points of greater practical utility. Suffice it here to say that Langstroth, in America, and Dzierzon, in Germany, about forty years since, contrived hives which give such mastery over the combs, that it became possible to manage bees in a manner previously altogether impracticable.

If a skep be inverted the combs will be found to be arranged in plates of greater or less regularity about lin. thick and $1\frac{1}{2}$ inches from centre to centre, but as they are fixed to the roof and partly to the walls of the skep no satisfactory examination of the combs can be made without breaking them from their attachments, and so wholly or in part destroying the hive. In the movable comb hive the combs may be lifted out and restored to their position without damaging bee handy work in the smallest degree. The plan by which this is managed in all English frame hives can be understood by reference to the form introduced by the late and deservedly celebrated Mr. Woodbury, and which bears his name. The hive is a box (Fig. 11), the lid of which lifts and discloses frames (in this hive there are ten) which have ears or lugs as in Fig. 12 which rest in rabbets on

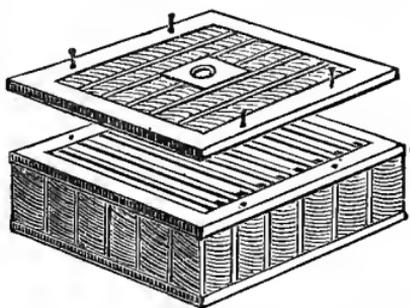


FIG. 11. WOODBURY BAR FRAME HIVE.

the hive sides. The frames in the Woodbury hive are kept at a proper distance from each other ($1\frac{1}{2}$ inches nearly from centre to centre) by

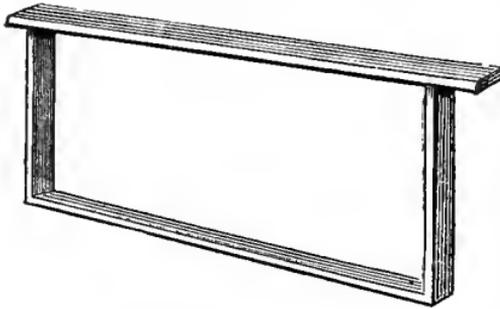


FIG. 12. BAR FRAME OF HIVE.

falling into notches made in the rabbet; but these notches are now almost, if not quite, discarded as the bees glue down the ends of the frames so firmly that the unaided fingers are unable to remove them, when they need be wrenched out by some lever, such as a screw-driver, much to the disturbance of the bees. The

frames do not touch the hive, except at the lugs, $\frac{1}{4}$ in. intervening between the outside of the frame and inside of the hive both at the sides and bottom; while the lid resting on the sides of the hive does not touch the top bars by the same distance. Bees placed in such a hive would build their combs probably in an irregular manner; but if they can be obliged to construct their waxen tracery within the frames, it is clear that lifting

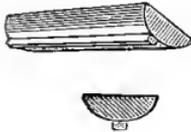


FIG. 13.

out a frame will also bring a comb with it which may be inspected and returned. As bees are disposed to begin their combs from any projecting edge, Mr. Woodbury fashioned the top bar of his frames as seen in Fig. 13. This will generally secure straight building in the greater part of the hive. In a subsequent chapter explanation will be given of means of late introduction which make straight building throughout a certainty.

Bar frame hives demand for their efficient handling a greater amount

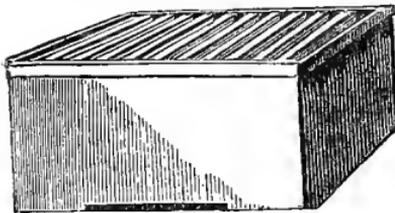


FIG. 14. ABBOTT COTTAGE BAR FRAME HIVE.

of intelligence than skeps, and this renders their introduction amongst rural bee keepers a slow work, but this is not the only impediment to their universal adoption. Frame hives are necessarily more expensive than skeps. To produce if possible a hive giving mobility of combs with a price within reach of the cottager, the British Bee Keepers' Association offered a prize for the cheapest hive with frames. The prize was awarded to Mr. Abbott. This hive, Fig. 14, is simply an unplanned $\frac{1}{2}$ in. deal box without bottom or top, Woodbury

of intelligence than skeps, and this renders their introduction amongst rural bee keepers a slow work, but this is not the only impediment to their universal adoption. Frame hives are necessarily more expensive than skeps. To produce if possible a hive giving mobility of combs with a price within reach of the cottager,

size, *i.e.* $14\frac{1}{2}$ in. each way inside, and $8\frac{3}{4}$ in. deep, having nailed around it slats which project $\frac{1}{4}$ in. above the sides. Ten rough frames, out out with a cutting gauge and braded together, drop into this, but have no arrangement for putting them into position. The spacing has to be done by eye. Bee keepers having a couple of saws and a hammer may soon construct such a hive, but having seen several of them in the apiaries of beginners, we cannot forbear remarking that cheapness is not

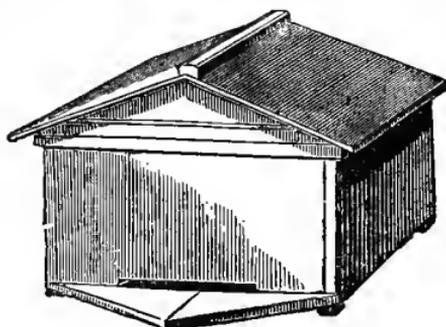


FIG. 15. ABBOTT COTTAGE BAR HIVE.

necessarily economy, and that the cheapness here is not the result of some ingenious simplification, but is obtained solely at the cost of completeness.

Mr. Abbott also makes a hive for 6s. 6d., Fig. 15, which is provided with roof and bottom board, and which, when well painted, would be able to take care of itself on a stand, although of course for comfort and convenience, it cannot be compared with the more complete and better finished hives. As a type of the latter kind, let us take the Cheshire Crystal Palace prize hive, Fig. 16, of which we give a detailed description for the benefit of those bee keepers who may desire to become their own hive makers. The frames here are of Woodbury size, but the arrangements given may be easily adapted to any other dimensions. Fig. 16 represents the hive as it would stand in the apiary. It consists of two main portions: the

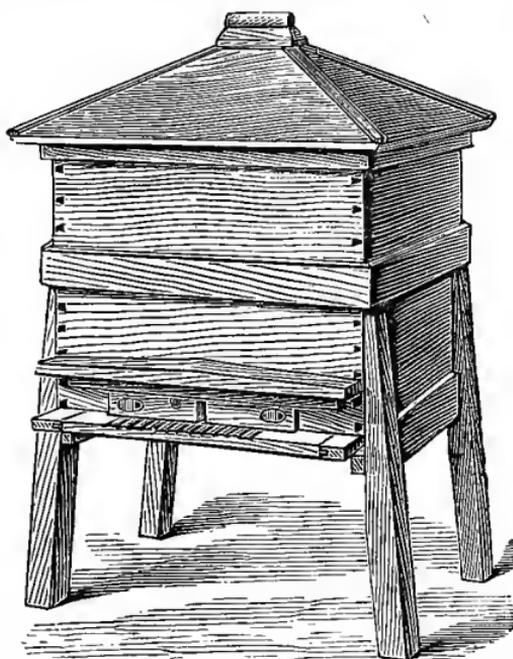


FIG. 16. CHESHIRE BAR FRAME HIVE.

It consists of two main portions: the

super cover, the upper half of what may be denominated the body, and the hive proper, in the lower portion of which breeding is carried on, and where the bees pass the winter. In front of the lower part may be seen the porch, with its roof consisting of a stout piece of pine, about 3in. wide, and running completely along the hive face. This is chamfered off towards the end, the more effectually to carry away drip, and has a channel near its front edge, which acts as a gutter, by which the rain is conveyed to its ends. This gutter is shown in the cross section, Fig. 17, at E. The bottom board of the hive projects $2\frac{1}{2}$ in. along the front, so as to form a very convenient alighting

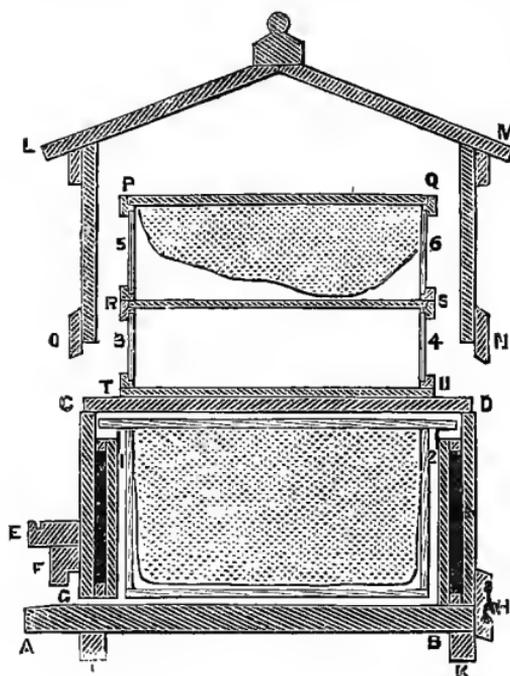


FIG. 17. CHESHIRE BAR FRAME HIVE.
SECTIONAL VIEW.

board; 10in. of the central part of this is grooved, as seen in Fig. 16, so that should it be reached by driving rain the convex parts remain free of water, affording the bees a dry passage way to the interior. In showery weather, in early spring, bees are often sacrificed by being turned wings downwards before the hive door upon a chilly pool; but by adopting this form this cause of loss is immensely reduced. The flight hole is also 10in. in length, and is formed by cutting from the hive wall a piece a full $\frac{1}{2}$ in. deep (see G, Fig. 17), F, Fig. 17, is screwed on beneath the porch roof give to it additional

stability and also to provide the groove for two sliding shutters (shown in Fig. 16), by which the entrance way may be regulated as occasion may require. Upon the upper part of the ends of these are two small studs preventing the shutters from meeting, so that the entrance can only be reduced to about half an inch. This arrangement prevents the accidental closing of the hive mouth, to the destruction of the colony, while it admits of its (*i.e.*, the mouth's) immediate lessening in the event of robbing, or for the purpose of wintering. Should, however, the absolute

stopping of the entrance-way be desired the doors may be removed, and put in, the right on the left, and the left on the right, when they will meet, as their studs will be on their outer instead of their proximate ends. In the height of the honey harvest, or near swarming time, the full length of the mouth may be obtained by simply sliding the shutters to the end of the alighting board, while during the summer the fanners will be enabled to pursue their labours in the shade. The bottom board is so contrived that it can be removed without disturbing the bees, as it slides upon two runners seen beneath it in Fig. 16. Blocks I and K (Fig. 17) fitted in between these runners and bottom board press it against the hive body and hold it in position. The legs are fastened to the hive proper, so that it carries its own stand. This plan is, in some respects, convenient. During the winter the board may be easily cleaned and returned without risk of disturbing the cluster; but the fixed legs present to the beginner some difficulty in introducing the swarm. So that for the general community of bee keepers we are not sure that the independent stand is not to be preferred. Either form can be supplied by Mr. Lee as desired. When the bottom board is slipped into position it is stopped by a back piece, H, Fig. 17. The super cover, the upper part of Fig. 16, or L M N O, Fig. 17, is hinged, and so contrived by the aid of a chain that it can only open until its lines, horizontal when *in situ*, become perpendicular, and *vice versa*. The advantage this supplies beyond the ordinary loose case is considerable. It is often inconvenient to find suitable standing for the latter during manipulation, while this arrangement provides the bee master with a table, often of great service when the hive is open, upon which he can place his smoker, syrup, knife, &c., during his operations. It, moreover, carries within it a slate with an attached pencil, so that immediate entry may be made of any noteworthy point. These jottings, compiled and studied, form no inconsiderable means of increasing the proprietor's experience. The other points of the exterior demand little in the way of explanation. The legs splay, so as to increase the base and give more secure standing, while the roof, with its ample eaves, precludes the possibility of the entrance of rain in any weather.

The walls of the hive are double, as may be seen by reference to Fig. 17, and have between them a space containing dead air, shown by the black broad lines. The sides are kept at their proper relative distances by blocks running above and below the air space. As heat is conducted by air with extreme slowness, these means prevent the escape of that generated by the bees during rigorous weather, while they also exclude the ardour of the sun's rays during summer. We are commonly told that straw hives are much drier than wooden ones in winter, and so it is argued straw is the better material for hive building, the additional proof of which is supposed to be found in the dampness of the wooden

band often seen around the straw skep at its base. We must beg to differ from this deduction, because we see in the non-conductivity of the straw its additional dryness. Wooden hives, *cæteris paribus*, are as dry as straw ones if they are made equally non-conductive, and this is fully achieved by double casing with an air space.

In order to give room for the ears of the frames, the inner skin, front and back, is made an inch shallower than the outer one. Standing three-

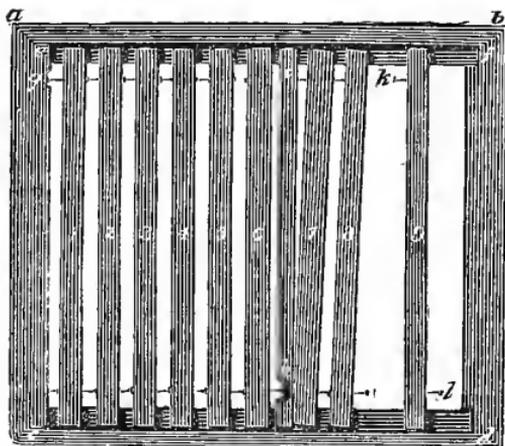


FIG. 18. FRAMES OF THE CHESHIRE HIVE.

eighths of an inch above the former are two strips of zinc (1 and 2, Fig. 17), each about an inch wide, and which serve to carry the frames so that they cannot be propolised, while they — *i.e.*, the frames — can be slidden backwards and forwards with the greatest ease during manipulation. The top bar of the frame is $\frac{3}{8}$ in. thick, so that the space between the top bar and the cover is $\frac{1}{4}$ in. The depth of the hive (D H, Fig. 17) is $8\frac{3}{4}$ in., the width between 1 and 2 $14\frac{1}{2}$ in., the frames being exactly the same in width as those known as Woodbury's. The length (*c d*, Fig. 18) will vary with the number of frames used, but 11 seems to give the hive the correct capacity.

It has already been stated that each comb and interspace should occupy $1\frac{1}{2}$ in. This, multiplied, by 11, gives $16\frac{1}{2}$ in., to which we must add $\frac{3}{4}$ in. for the dummy, *h i* (Fig. 18), so that *c d* (Fig. 18) equals $17\frac{1}{4}$ in. The size of the frame will be readily reached if it be remembered that it should be everywhere $\frac{1}{4}$ in. from the hive, because in this amount of space bees are unwilling to build comb, while smaller openings they fill in with propolis.*

Fig. 18 shows the arrangement of the frames, which are kept at their correct and relative distances by means of small nails known amongst carpenters as panel pins. Frames 10 and 11 have been removed in order to place frame 9 by itself, the better to show its two distance nails, *k* and *l*. These are driven in immediately over the side of the frame, so that when the latter is removed they cannot tear the combs, and are also

* Propolis is a resinous glue collected by bees and used for stopping all crevices. A further explanation is given later.

placed on the opposite sides of the top bar, which thus fits equally well either way round. The bars being $\frac{3}{4}$ in. wide, the distance nails all project $\frac{3}{4}$ in., making up the $1\frac{1}{2}$ in. previously referred to. Between the hive side and frame 1 only 5-16 in. is required, and therefore a hollow is cut at *g*, into which half the length of the pin passes, while at the opposite point a pin projects 5-16 in. from the hive side to retain the frame in correct position. The dummy (*h i*), which usually hangs next the hive side, and gives play to the combs by its removal, is simply a double board the same size as a frame, and having the grain of its respective thin halves running in reverse directions to prevent warping or breaking. These are fixed to each other by means of $\frac{3}{4}$ in. screws. One side is cut away (as shown at *h*) so as to admit half the length of the distance pin. This cavity extends from top to bottom of the dummy, or it could not be drawn out of the hive without disturbing the comb next it, while at *i*, on the left side, a distance pin is fixed in the dummy, and projects 5-16 in., giving again the half interspace required. Combs 1 to 6 are shown *in situ*, and by having the dummy as in the figure, a small swarm, instead of weakening itself by excessive distribution, would be cosily confined to about half the hive; and in some cases it might be an economy of heat, and in other ways advantageous to still further reduce their working space. It is here worthy of remark that removing the dummy from the end of the hive beyond frame 11, where it would usually remain, and placing it in any part does not prevent the 11 frames being accommodated as before, for if the dummy stand as in the figure outside No 6, the frame beyond it, *id est*, No. 7, will touch the dummy at one of its ends, and so give space for the full length of the distance pin on the last frame. To return to our supposed small swarm; as its comb increases and its numbers multiply, an unoccupied frame may be lifted out, when the dummy and half the frames containing combs should be pushed to the right, and into the aperture thus formed in the colony the empty frame should be inserted. The bees will immediately labour with unusual earnestness to fill up the gap in the brood nest, and as quickly as the comb is built the queen will insert eggs within it. The operation is to be again and again repeated until the whole hive is filled. Small swarms, very gently but yet continuously fed, as elsewhere described, will, under this system, not only quickly fill their hives, but will produce that numerous working population without which large and handsome supers will be always looked for in vain. These lines on management must be regarded as a parenthesis, since many bar frame hives now in existence will admit perfectly of its application. The depression in the hive side affording room to the ears of the frames, should extend as at *c* and *d* (Fig. 18), giving finger way on both sides of the dummy, and materially helping in its convenient withdrawal.

Fig. 19 represents the Cheshire crown board, the edge of which is seen

at C D (Fig. 17). For the hive under description it consists of five strips or slats, clamped at their ends to prevent warping; these are each $17\frac{1}{2}$ in. long. The width of the central strip is 5 in., while that of the others is $3\frac{1}{4}$ in. The central one is pierced with a hole $1\frac{1}{2}$ in. in diameter, and over this is placed our feeding stage. This consists of a plate of vulcanite, perforated with several holes in a particular pattern, and fixed by the screw S, around which it can, within certain limits, rotate. While the stage is situated as in the figure, the feeding hole is

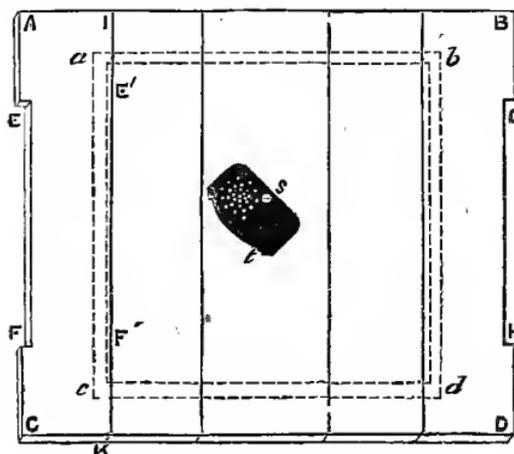


FIG. 19. CHESHIRE CROWN BOARD.

beneath the part without orifices, and the bees in consequence cannot reach the syrup bottle which may be placed upon it. At *t* is a stop, and this prevents the plate being turned further to the left. When food is to be given, the rotation towards the right brings the perforations in succession over the feeding hole, and the bees are allowed in greater or less numbers to take the syrup. The form of the plate will explain

how the stop (*t*) holds it when the maximum of the feeding rate has been reached. At E F and G H the top board is cut away $\frac{1}{4}$ in. in width and 10 in. in length. Notwithstanding the removal of these parts, the board completely covers the hive top, but if the outside slat (A I C K) be made to change places with the one next it, E F will occupy the position E' F', and will form a long hole or slot, which will give the bees ingress to the super, the frame of which occupies the position of the dotted lines, *a b d c*. The same being done on the other side, the bees, whose loads are to become ours, are freely admitted to the storehouse we have placed, with no unselfish views, for their accommodation; while the queen, the nurses, and the pollen gatherers of the centrally situated brood nest beneath are prevented by an unbroken ceiling from passing up into and spoiling our super.

The supers (P Q R S T U, Fig. 17), were not exhibited with the hive, and are those for which Mr. Lee obtained first prize at the Crystal Palace; their sides (3 4 5 6) are of glass. One is at first placed on, and after the bees have well advanced with it the second is inserted beneath it. In shallow supers bees start more promptly than in deep ones, while

they ever strive to close up gaps, hence the advisability of having two, upon which more must be said when we come to the art of supering.

There are not a few bee keepers, although their number is very significantly decreasing, who believe that bees cannot thrive in wooden hives. Wild bees they forget got on well for ages in hollow trees. With them there is nothing like straw, and this principally because some observed facts have been misunderstood and misinterpreted.

Hive makers have, to meet these, striven to produce frame hives, the outside of which should be as nearly as possible oatstalks alone. As a result of this effort, we have the Sherrington (Fig. 20), which, no doubt, in its improved form, is good, although unnecessarily cumbrous and heavy, especially about the roof, which could hardly be removed by one pair of hands. The Woodbury, the Cheshire, and most other frame hives can be had in straw. The



FIG. 20. THE SHERRINGTON HIVE.

plan adopted is somewhat different to that in the Sherrington, as the angles of the hives are made in wood into which plates of compressed and sewn straw are fixed. We have again and again tried these hives by the side of those in all respects similar, save that the material has been exclusively wood, and have found no appreciable difference. In the Sherrington a form has been given to the top bars which will be best understood by reference to Fig. 21. Each of these has projections near the ends which keep the frames at correct distances from each other while they rest on the side of the hive. These frames were

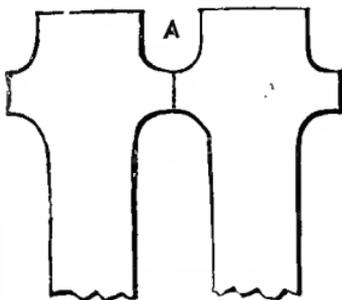


FIG. 21.
FRAMES OF THE SHERRINGTON HIVE.

introduced by Mr. Abbott in the hive seen at Fig. 22, and were designed in order to admit of the use of a quilt,* as it is termed instead of a

* The quilt may consist of any hard textile fabric, and Brussels carpet, wrong side downwards, has been largely recommended, but for winter use phrail is immensely its superior. See a subsequent chapter.

crowns board. The former is simply placed upon the top of the frames.

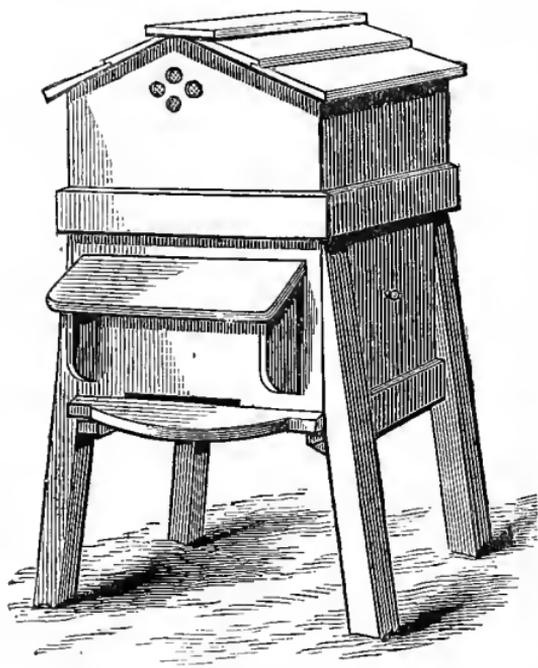


FIG. 22. THE ABBOTT BAR FRAME HIVE.

The ends of the frames are beyond the reach of the bees, and are consequently not touched with propolis, and so may be handled without soiling the fingers, but they get seriously propolised to each other and to the hive, and cannot be moved without a most disquieting jar, which much increases the difficulty of manipulating. The frames, too, as found in Mr. Abbott's hive, cannot conveniently be placed temporarily beyond their normal distance from each other, a considerable impediment as we shall presently see, while the wood swelling and shrinking, always makes

the frames either too loose or too tight. This latter defect we quickly removed by a simple device.

The hives previously mentioned are known as supering hives, from the Latin preposition *super* above, because by their use the surplus honey is stored in boxes or glasses (supers) above the hive. Where the surplus receptacles are situated by the side of the stock-box or hive proper, the latter is called a collateral hive. This style is not in general repute, and requires no further notice in a short treatise like the present. But a little attention must now be given to a description of hive in general estimation in Scotland, while it is a great favourite with many advanced bee keepers south of the Cheviots. I allude to the Stewarton, the stock boxes and supers of which are all octagonal of the same measurement horizontally, though differing somewhat in height. The top bars have a special form given to them, so that their interspaces may be closed by a slide, making the top board unnecessary. Propolis, however, often makes their removal difficult. The figure (Fig. 23) giving the end view of the bar and slide will make the working of both sufficiently obvious. The octa-

gonal form of the Stewarton is, in the opinion of that charming writer, "A Renfrewshire Bee-keeper," an immense benefit to the colony during winter, but it prevents the complete interchangeability of combs, which a rectangular hive



FIG. 23. BAR AND SLIDE OF THE STEWARTON HIVE.

possesses. The Carr Stewarton (Fig. 24), designed by C. W. Smith, Esq., retains the square form, while it gives us completely the telescopic character of its prototype. Both of these hives may be extended by the addition of stock-boxes and supers to suit precisely the strength of the colony and the yield of honey, while they can be with the utmost facility compressed as seasonal exigencies may demand.

Before closing this chapter we ought to mention that the details of our hive have been given as it was exhibited, but we have since introduced one or two modifications, which we believe are also improvements, and which are of general interest, since they can be added to hives of almost any pattern. Instead of the chain attached to the hinged super case, which in some positions of the operator slightly interferes with his movements in lifting out frames, we now screw to the



FIG. 24. THE CARR STEWARTON HIVE.

super cover one arm of an L shaped crank, the other arm of which comes against a stop on the side of the hive as the latter is opened and holds the lid in position. Those who once use this form will, we feel convinced, never again take kindly to loose super cases.

Super cases require ventilation, and the perforated zinc, covering the usual window, we have made to slide. When closed no bee can enter, but by opening it and placing over it our five-pin trap, supers can be at once cleared of bees without the smallest trouble to their owner. More is said of this hereafter.

We now let the dummy hang quite clear of the hive side with $\frac{1}{4}$ in. interspace. By so doing propolisation is more completely prevented, and more room is obtained for the removal of the first frames. Our hive would thus for eleven frames have an internal width of $17\frac{1}{2}$ in. instead of $17\frac{1}{4}$ in., as stated at page 18.

There is danger of the ends of the ears of the frames getting attached to the hive by propolis, and where this happens it much interferes with the comfort of working. It may be prevented either by reducing the length of the top bar so as to leave $\frac{1}{4}$ in. interspace, or by cutting the ears to a point by chiselling off a piece on one side only at an angle of 45° . This gives the bees rather more opportunity of working their little tiresome trick, of fixing that which we require to be loose, than the shortened top bar, but it prevents the liability of getting the end of the frame itself too near to the side of the hive. However, this mischance would rarely happen with a careful operator.

Many good hives have not been mentioned, but enough has been said to point out the salient points of the greater number. Let us remember that hives gather no honey. They may be of the correct size and shape; may give our bees most efficient protection, and afford every facility for manipulation, but the observant and attentive bee keeper alone will reap from them all the harvest they are capable of supplying.



CHAPTER IV.

EXAMINING HIVES

BEE DRESS—SMOKE—EXAMINING A SKEP—DITTO A FRAME HIVE:
—HANDLING COMBS.

BEFORE explaining how the bees are to be managed, it is well to describe how the bee keeper is to be made master of the situation: for at first his favourites will be more disposed to resent his interference than after he has acquired the method of deftly performing the necessary operations of the apiary. With the novice, the more complete the protection the greater the calmness under unexpected difficulty, so that we would recommend such to dress thus: Gloves of indiarubber, like those used by photographers, and which are lined, for those consisting of rubber exclusively, although less clumsy, are too troublesome to put on and take off. To the gloves should be added gauntlets of calico about 5in. or 6in. wide, carrying an elastic band, which, passing over the coat cuff, absolutely saves the hand from all danger. In chilly weather especially bees are likely to fall on the ground and crawl up the legs of the operator and administer stings under pressure, so that a string round the trousers may not be without its advantages. To protect the face make a veil in the form of a bottomless bag by joining the ends of $1\frac{1}{2}$ yds. of coarse leno; run in an elastic at the top, about 15in. long, so that it may clip round the hat as in Fig. 25. The veil passing over the shoulders and buttoned under the coat will enable us to laugh at the assaults of the enemy, if the hat-brim be only broad enough. We generally carry in our pocket a bee-veil made of fine silk net,



FIG. 25. BEE VEIL.

which, although expensive, is very durable, and occupies very little room when folded up, while it admits of a much better view through it than leno, on which account we strongly recommend it to those desirous of studying the economy of the hive. A little practice will cause all protective dressing to be discarded but the veil, and this often may be found unnecessary.

But smoke is the beekeeper's talisman, and with this properly applied bees may be completely tamed or rather terrified into submission. If in the summer time a skep be lifted from its stand even with the greatest care, many of the brave little inhabitants will sally forth to repel the disturber, but if a few puffs from a pipe or from smouldering rag had first been blown into it, the bees would have retreated between the combs, where they might have been easily kept by a further dose after the skep had been lifted and turned up for examination. The habitual smoker perhaps needs nothing in addition to his pipe, but for those to whom "the weed" is no solace, let us describe our little prize apparatus (Fig. 26),

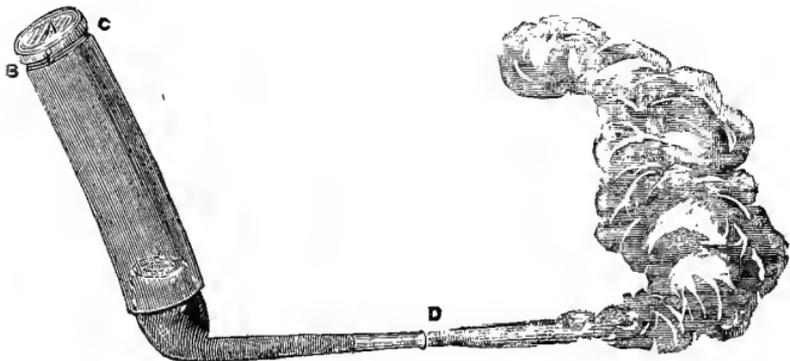


FIG. 26. SMOKER.

which has at least the advantages of durability and simplicity, while it can be easily made by any who would possess it: a piece of indiarubber tube about 1 in. in diameter, and 6 in. long is fitted over the bowl of an ordinary pipe, rather briar root than clay, while the end is closed with a wooden plug or short cork tied well in with wire or string. If, after the pipe has been charged, a fusee be dropped into it, and the indiarubber tube placed in position, the hand can easily work the latter by alternately compressing and releasing it: at each squeeze a stream of smoke will issue, which may be driven in any direction. The lover of his pipe may to it add the indiarubber, when he will find the arrangement very convenient; but for the non-smoker it will be

better to have a piece of wood turned as in Fig. 27. The hole in this at the smaller end may be drilled larger than a pipe bore, while into the

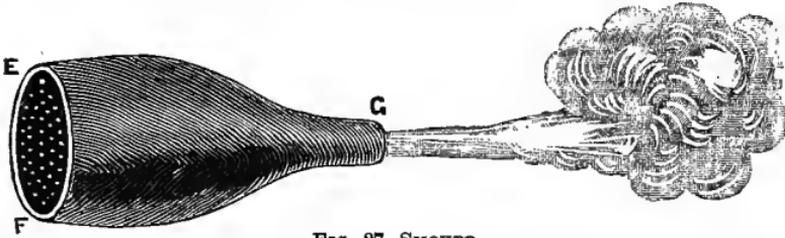


FIG. 27. SMOKER.

base of the part we may call the bowl a piece of perforated zinc being fitted, the tobacco will not drive its way into the opening and close it. Old rag, fustian, or even brown paper rolled up into the form of a torch will smoulder and furnish a supply of smoke for hours, but these torches, except for prolonged operations, are not so convenient as the apparatus described, or the little bellows-form introduced by the Rev. H. Bligh, while the bees are likely to fly at them and perish miserably. The sound and sight of singeing wings and writhing burning legs are not such as most bee-keepers could complacently endure. With this latter source of smoke, too, it is often impossible to drive the terrifying cloud into the exact spot needed. Very rotten wood where obtainable may replace the rag or paper.



FIG. 28.

Duly equipped, we may now proceed to make an examination of a hive which, if of the old type in straw we already see how to attack. Blow into the entrance two or three puffs, wait two or three seconds, during

which the alarmed inmates rush up instinctively to their honey to fill themselves, so as at least not to be driven away without some resources. Probably not a bee will fly when we turn the whole over and peer down between the combs, whence, by a well-directed discharge of smoke, we may clear the bees so as to get a notion of the condition of things. We ought to find from early spring to late autumn, especially near the middle of the hive, patches of cells sealed over with brown convex caps; these contain the maturing bees, called in bee parlance "sealed brood" (see Chapter I.), and their existence is an evidence of the presence of the queen. Towards the sides we should also see cells closed with slightly concave and whiter caps; one of these being removed with a knife the cell will be found to contain honey.

With a frame hive we may see and do much more: proceeding similarly so far as the smoke is concerned, we may lift the top board, driving the bees downwards if they appear troublesome, and, after sliding out the dummy, if the hive possess one, lift out a first frame, when we can readily see the stored pollen, distinguished by its colour and mealy appearance, the cells half filled with honey, and those full and sealed. In raising and handling the frame we must be cautious not to jar it or breathe upon the bees, or we shall certainly irritate them. Carefully keep the comb hanging plumb, or if new and tender it may fall from the frame (see Fig. 28), which is reduced from Langsworth, and shows his double storied hive, mentioned by and by while speaking of the "Extractor." The end of the frame, held by the right hand, must not pass to the left, or we shall be likely to put the frame back the wrong way round, and as combs are never mathematically straight, imperfect fitting and possibly considerable discomfort to the bees will follow. In order to get a view of the other side of the comb, drop one hand and raise the other until the top bar becomes perpendicular, when the frame may be revolved, the top bar being the spindle, without the smallest risk. To assist in the correct restoration of the frames, number them seriatim on the top bars. Replacing the frame and leaving as much room as possible for the safe withdrawal of the next, we continue our examination, and find sealed brood; keeping a sharp look out for the queen, who will probably be observed where brood also exists, we trace the eggs and note the white advancing grubs. If the bees assert themselves, give from time to time little doses of smoke, but only sufficient, and molestation will cease. Be most scrupulous about the safety of the queen in putting all again into its original condition. If we can thus far manage we may consider ourselves as advancing in our novitiate and take courage as to our future competence.

CHAPTER V.


 NATURAL SWARMING.

TIME OF—CAUSE OF—SECURING A SWARM—WHEN TO REMOVE
 TO STAND—PRESENCE OR ABSENCE OF QUEEN—SIGNS OF—
 PACKING SWARMS FOR JOURNEY—INTRODUCING TO FRAME
 HIVES—TO HIVES WITH FIXED LEGS—SWARM WITH LOST
 QUEEN—QUEEN CELLS—PIPING—CAUSE OF—SIGNS OF CAST-
 ING—VALUE OF CASTS—OFTEN FLY FAR—TREATMENT OF
 WHEN QUEEN IS LOST—CASTS BUILD WORKER COMB ONLY.

As the spring advances, food continues to come in abundantly ; stocks that have passed the winter well begin to grow very numerous, and usually in this country in May or June make preparation for founding a new colony, or, in bee parlance, swarming. Many beekeepers entertain the notion that swarming is merely the direct result of want of room, the teeming throng from overcrowding being driven to divide into two communities, but this idea is found upon experience to be incorrect,* while a careful consideration of some analogies in natural history would have shown the cause of swarming to lie much deeper, as we intend to point out in our larger book now in hand. Space and our title "Practical Beekeeping" both forbid any dilation on this point here. The swarm takes with it the old queen, and preparations are usually commenced for providing her successor for the parent stock some days before the swarm leaves. If, therefore, a colony of bees in the spring has advancing queen cells (see Fig. 29) while the old queen is still amongst them, it may be concluded that, the weather being favourable, swarming will not be long delayed. On the morning of the day fixed for departure the hive will show but little activity, while at the door of others the workers are busily thronging in and out. Some tell us that a signal within must be given, since all the teeming thousands seem to be seized with some violent agitation ; but of this we know nothing, except that the bees about to forsake the place of their nativity for "pastures new," commence to run about

* Stocks having built in a cottage roof or a church tower, and having almost unlimited space, have been observed to throw off swarms with about the same regularity as those restricted by hives.

the interior of the hive in wild excitement, while the ordinary course of bee labour is for the nonce suspended. The would-be emigrants are not apparently unmindful of the necessity for preparing to the utmost of their ability for the contingencies of this expedition, so every bee about to depart fills to repletion her honey bag; and now, as they rush to the entrance, the headlong exodus commences, each bee as she rises from the alighting board circling broadly and humming loudly, calling us to the inspiring cry "The bees are swarming." More are yet pouring through the narrow doorway, and as we watch we may catch a glimpse of the queen herself as she takes wing to join her children—for the common idea that the queen issues first and that the bees follow is quite erroneous.

We note that the giddy multitude now begins to somewhat concentrate, and to make a progress in some definite direction, and, taking this as our cue, we find the chosen point for alighting where the whole gather into a dense mass, usually of the shape of a melon or pear. The fashion of rattling keys and frying-pans is now nearly exploded. In ancient times it seems to have been the practice to warn neighbours of swarms rising by ringing bells and making noises, and this by misinterpretation has associated the clatter with the settling of the swarm. Langstroth tells us that if a swarm is disposed to take a longer flight than desirable before settling, it may be brought to earth by throwing dust amongst the intending fugitives, while he and others also have stated that flashing a sunbeam from a looking-glass amongst them will have the same effect, but we have never had the opportunity of putting either of these suggestions to the test. When a swarm has once fairly settled, our first object should be to keep it cool, for the universal excitement and close packing of the cluster raise the temperature to an almost unbearable extent, and the direct rays of the sun may before long drive it to a new, and for us most inconveniently lengthened, flight. If the settling place has been a bush, cover the latter with a sheet, and in very hot weather let this be well sprinkled with water; if a tree, an umbrella with its handle thrust in amongst the branches may give the welcome shade. We must now prepare for hiving, and, in undertaking this little business, we shall do well to remember that bees are exceptionally good tempered as a swarm, for all are gorged with honey, but that the statement that swarming bees will not sting is an utter and very misleading mistake. We have been stung in the face by bees flying out from the cluster when we have given no provocation, and have had our hands literally covered with stings in hiving swarms that have settled in situations whence it has been difficult to secure them. The novice should be veiled and gloved also, unless the position taken up is a convenient one, such as the end of a tree bough. If the swarm is intended to remain in a skep, it had better be hived into the one it is to permanently occupy. If a frame hive is to receive it, let it be first secured in a skep and then turned into the frame hive as presently described. We

have just said that the end of a tree bough is a convenient position from which to hive : let us suppose that we have a swarm so situated, and that the bough is not above our reach while standing on the ground. With one hand we hold the skep (which should be clean within and clear of all bees and sugar abominations) immediately beneath the swarm, whilst with the other hand we grasp the bough as near as possible to the bees without crushing any, and with a short and quick down and upward movement we shake as many of the insects as possible into the skep. The novice would expect every bee to fly ; some few hundred will do so, and career around, but the great bulk, powerless in reciprocal embrace as they hold one on to another for mutual support, fall in mass, and are directly under our control. The floor board of the skep may have been placed immediately under the position taken up by the swarm, and then the hive may be slowly turned over upon it, having one of its edges well propped up by a stone ; or the skep may be turned over upon the earth if it be smooth and free from dust—in this case, also, taking care that there is abundant space for ventilation. Mr. Pettigrew, we think, prefers to place the floorboard over the skep while the latter is inverted, but let us caution the beginner against hurry in this matter, or he may crush the queen as she runs over the edge. Screen the skep from the sun ; use a leafy bough for this purpose if nothing more convenient be at hand. If, after the subsidence of the temporary commotion produced, you find that the bees are beginning to draw near to the hive, even to enter it, while the number left on the bough seem excited and bewildered, running hurriedly about, and now and again taking a little turn on the wing, you may conclude that you have secured the queen, and that before long all will be comfortably clustering within the hive. But if, on the contrary, the bees within the skep are apparently disquieted and begin to leave it in numbers, whilst the mass on the bough is comparatively tranquil and evidently increasing in bulk, you may be pretty sure that the queen is not in your party, and that the previously described operation will have to be repeated. In lifting the skep again use great gentleness, and almost all the bees will be lifted with it, as they will be hanging from its roof. A little practice will soon enable the operator to determine whether the queen has been secured ; for the initiated, the mere appearance of the remainder of the cluster will at once be sufficient. If the bough is at a considerable height from the ground, the better plan sometimes is to cut it off at some distance above the cluster and bring it down to a convenient position for shaking into the skep. Bees sometimes settle close to the main stem of a tree where many branches are given off, and then the difficulty in hiving is greatly increased. The skep may in some cases be stood over them and they driven towards it by smoke ; or they may be brushed into it by a goose or turkey feather while it is held beneath ; but for cases of this kind no specific rules can be given ; much must rest with the ingenuity

of the operator. Should the swarm be intended to stand near to the position in which it was hived, it should be removed thither as soon as all have quietly taken up their quarters, for, after swarming, bees carefully mark their new location, and those taking a flight before the hive is placed on its stand are in danger of being lost by returning to the wrong point. If, however, the swarm is to be taken any considerable distance it should be left where hived until late in the evening, when a piece of coarse canvas should be spread out smoothly upon the ground; the hive, lifted very slowly and cautiously, so as not to break the cluster of bees all hanging from its roof—much in form like a swallows' nest under the house eaves—is placed upon the canvas, which is drawn up round its sides and tied with string. The skep is now inverted, and may be carried with safety, to porter and bees, to its destination, or conveyed by cart or rail, the essential point being that the canvas is kept *upwards*. The uneasy hummers within get thus ample ventilation, and, being well provided with honey, can endure incarceration for a day or two. Let those in charge understand that the canvas must not be excluded from free contact of air. Some railway people lately covered three Ligurian swarms of ours with tarpanlin "to keep them quiet." The expedient succeeded—every bee reached its destination dead. The skep containing the swarm should, upon its arrival, be placed on its bottom board and stand, the string untied, and the canvas released from the mouth, but not removed until the bees have had time to get clear of it by clustering above. It is well to leave it not less than two or three hours, when it may be slipped away as the hive is lifted.

We have previously stated that if the natural swarm is intended to tenant a frame hive it should still be first taken in a skep, so that it remains for us to explain how to pass the bees from the former to the latter. Spread out upon the ground, as near as may be convenient to the final station, a table cloth or sheet, spreading it out as smoothly as possible, and fixing down the corners by stones or wooden strips so that the wind may not disturb it. Place upon this the wooden hive from which the bottom board has been removed, so that its back edge comes to the edge of the cloth or thereabouts, giving us a considerable unoccupied area upon which to throw our swarm. Prop up the front of the hive with a stone or block at each corner, leaving about an inch space in front for the bees to enter. Cautiously raising the skep with the contained swarm, and standing with the feet well asunder, while holding the skep firmly between the open palms, with a sharp, sudden, and decided jerk, shake out the bees upon the sheet: dropping, as it were, and catching the skep between the hands, we beat out of it the few dozen remaining bees. The fallen swarm, startled, does not attempt to take wing, and for the first three or four seconds merely spreads out upon the sheet, but the suitability of the hive is immediately recognized by the party advancing into it, who at once start a joyful note which calls the whole body towards the newly adopted home

and in a moment, as if by magic, every head stands towards the hive, and the march progresses until all are safely within. Sometimes there seems some hesitation, and the bees will advance, but not quite in the direction desired; if this be observed, they may be spooned up with the same facility as if all were dead, and dropped near the hive mouth; and, unless the handling be rough and careless, not a single bee will sustain injury. If they gather much on the hive front they may be scraped off with a card, or brushed down with a feather, but a little patience will generally be found more serviceable than too much anxious meddling. If the queen is seen to enter, all further troubling is needless, as the bees will most certainly follow. With hives with fixed legs a large board propped up under the alighting board will replace the sheet, and all will proceed as before. Instead of these plans, the cover may be removed and the cluster thrown down upon the top bars of the frames, but the bees are so likely to "boil over" the hive sides, as it were, that beginners are not recommended to try it.

Sometimes swarms issue, and, without apparent cause, return. Perhaps their queen has defective wings, and is unable to fly. If the bees after issuing continue in great commotion without decidedly clustering, search may be made for the mother on the ground in the neighbourhood of the hive, where she will often be found accompanied by half a dozen or a dozen of her children. Placing her upon a convenient twig the bees will soon gather around her, and this they will do equally if she be retained in the hand, though perhaps few of our readers will sufficiently feel the harmlessness of the experiment to try it. By putting the queen in a skep and placing it upon the stand from which the swarm issued, the latter will soon return and join her, when they may be placed in any position we please, since bees under the swarming impulse seem to utterly disregard the stock to which they previously belonged, and return only to the new abode, wherever that may be.

The hive whence a natural swarm has just issued will be found to contain large quantities of brood and eggs, while a sufficient number of bees, ordered by that hidden wisdom which we call instinct, has remained to carry on the work of tending the advancing grubs, maintaining the temperature, and completing the work of raising new queens, already in progress when the swarm left. The cells containing the princesses will be known by their acorn-like shape (see Fig. 29), where *a* shows the complete cell which will be gnawed round by the nymph at *b*, until a lid, as at *d*, is opened, when she makes her escape. The cell will after-

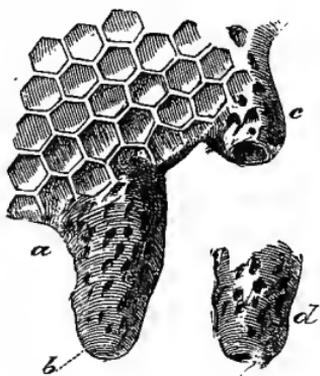


FIG. 29. QUEEN CELLS.

ward be gnawed round by the nymph at *b*, until a lid, as at *d*, is opened, when she makes her escape. The cell will after-

wards be cut down by the bees until it assumes the form *c*. The number of queen cells runs from about 3 to 20 or even more, and are in different stages of progress, so that they would produce young queens at intervals. If the stock intends to send out no second swarm the first queen leaving the royal cradle is allowed to follow her instinct of intense hatred to a rival, she stinging her sisters to death, while the bees themselves assist in tearing open the cells containing them. The colony, depleted by swarming, is now receiving by hatching additions to the extent of from 2000 to 3000 per day, a number equal to the number of eggs deposited by the old queen three weeks before. The seven or eight days which usually elapse between swarming, and the birth of the first princess therefore supplies sufficient for another migration, and with thoroughly vigorous colonies—unless the beemaster prevent it, as presently explained—a second swarm or cast as it is termed, generally issues. The bees thus deciding, keep careful guard over the cells of the princesses, of which the one first hatched is prevented from injuring the remainder, being driven back and given to understand, as Langstroth says, “That even a queen cannot do in all things as she pleases.” Like some human beings who cannot have their own way, she is highly offended when thus repulsed, and utters in quick succession of notes a shrill angry sound not unlike the rapid utterance of the words “peep, peep.” To this angry note one or more of the unhatched queens will respond in a somewhat hoarser key, just as a cock by crowing bids defiance to his rivals. This sound, called “piping,” which cannot be mistaken for any other made by the bees, may be heard by placing the ear against the hive in the morning or evening before the issue of any swarm after the first, and, as the cast usually comes off nine days after the swarm, let the beekeeper listen as described, on the evening of the eighth day, when, if piping be heard it is a tolerably certain evidence that the hive will throw a second swarm, the exception being caused by very unfavourable weather, obliging the bees to permit the destruction of the princesses. Frequently, in the excitement of casting, some of the queens over which guard has been kept will make their escape, and fly from the hive. We had a late cast one autumn which settled in two masses in an apple tree. After hiving and throwing down in front of the stock whence they came, in order to return them, we found five queens amongst them, each of which we placed in a small hive (a nucleus, hereafter explained), with a little cluster of bees; and when they had mated and commenced laying, we utilized them for displacing old and worn out queens in other hives. Sometimes, as the queens continue to hatch, a succession of after swarms comes off, which are generally so weak in numbers themselves, while they so depopulate the stock, that neither they nor it are of much service—at least, for that season. Four or five years ago we had four swarms in five days from one hive, which in this case afterwards gave us a super,

while all of the swarms became strong colonies; but this was quite exceptional, and was after all secured by the kind of attention which bees do not always get. Casts are less numerous generally than swarms, but as every bee they contain is young, queen included, with its life of work before it, they are not to be despised, but it is usually bad economy where increase in stock is not required, to allow casting at all. With frame hives it may be prevented by examining the combs five or six days after swarming, and destroying all queen cells but one. If it be done earlier than this, new queen cells may be started because eggs or grubs young enough for conversion into queens would still remain in the hive. With skeps the cast must issue, be deprived of its queen, and then returned. Swarms, accompanied as they are by the old queen, whose maturity brings discretion, seldom come off except in clear fine weather, and then rarely before nine or after three o'clock; but after swarms, going with giddy lasses, often rise with the elements not quite propitious, and at widely different times of the day, while their flight is likely to be much more extensive than that of first swarms. The apiary therefore requires careful watching, while they are likely to issue, but since the last queen must be hatched by the sixteenth day after her mother left the stock, all after swarms must be out by the eighteenth day.

The queen accompanying a cast has to fly to meet the drone (see Chapter I.), and here lies a source of uncertainty, for should any accident befall her, the colony must inevitably perish, since they are destitute of eggs, without which they are unable to replace her. Such a calamity occurring, the beemaster should, if possible, at once furnish to them a new queen, or a ripe queen cell, the methods of introducing which will presently be explained; but, lacking these, a comb from another hive containing both eggs and brood will enable them to supply her place, but not until much mischief has been done from the building of drone comb, as shown more fully in Chapter VII. But a cast, with its virgin queen, who must mate with a drone already in existence, does not normally colonize till a succeeding season; so that for them male bees are needless. How suitable then is their habit under these conditions, of filling their hives with combs, amongst which but very few drone cells appear.

CHAPTER VI.



DRIVING OR DRUMMING BEES.

CLOSE DRIVING—OPEN DRIVING—HUNTER'S HINGE AND SKEWERS
 —DRIVING IN COLD WEATHER—SPRINKLING BOTTLE—DIFFICULT
 CASES OF DRIVING—DRIVING FROM BOX HIVES—WHY DO BEES
 DRIVE ?—THROWING—DRIVING IMPROPER AFTER HOT DAYS.

OUR last chapter has given some account of natural swarms, and it would appear to some that artificial swarming should now receive attention; but before we can swarm artificially with hives with fixed combs, it is necessary for us to understand the art of drumming or driving bees from their house and home, so as to place them at our disposal. The plan usually followed may be thus described: The skep to be drummed has a puff or two of smoke from tobacco, burning rag, or smouldering wood driven into its mouth, so as to frighten its inhabitants, and cause them to fill themselves with honey. The hive is lifted from its floorboard and turned bottom upwards upon a tub or pail, so that it has a firm standing; upon it is placed an empty skep having exactly the same diameter as itself; a jack towel or bandage of some description is fastened around the edges of the two hives in such a way that not a bee can escape. The lower hive, *i.e.*, the one containing combs and bees, is now beaten with sticks or by the hands, so as to jar the whole fabric and terrify the bees, whose composure has already been upset by the smoke blown amongst them. The beating must be continuous, but not violent, or we are likely to break the combs from their attachments, and so merely bury our bees in the ruins of their city. In from one to five minutes they will be found rushing, whilst making a roaring noise by vibrating their wings, into the upper hive, from the roof of which, upon separating the two, they will be found hanging much like a natural swarm.

The method so far outlined is called close driving, because the edges of the two hives are brought into contact as perfect as may be, and the escape of even a single bee is prevented. In this particular it will recommend itself to the beginner, whose nervous dread of a sting yet weighs with him in his choice of plans, but for expedition, artificial swarming,

removal of queens, &c., it is not to be compared with open driving, for which commence as before, but place the hive to receive the driven swarm over the other at an angle, as in Fig. 30. We usually thrust two ordinary kitchen skewers through the lower hive near the rim, and about 6in. from each other, so as to afford a convenient stop for the upper skep, the front of which is held by one hand. Mr. Hunter has introduced a neat little wire hinge for fixing the skeps together, while he adds the wire rods as in the figure, for holding the skeps in any desired relative position; these have the considerable advantage of entirely freeing the hands of the operator. By looking at our woodcut, we shall see that the skeps are in contact at the point towards which the combs run, and this is important, as here the bees escape

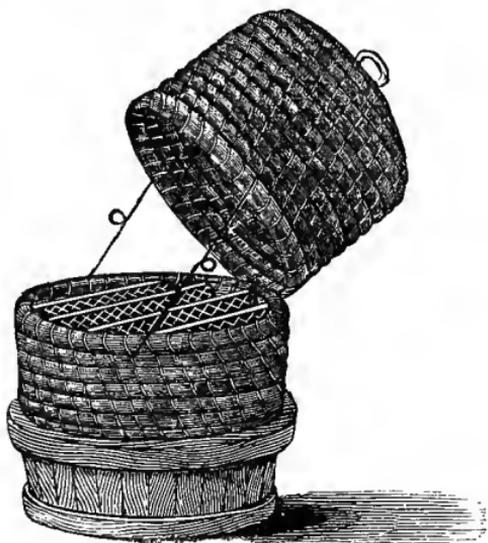


FIG. 30. OLEN DRIVING.

most easily, and seethe out in the greatest numbers. The shadow, too, in the illustration indicates how the light should fall. Let the operator stand with his back to it, and he then will secure a thorough view of the bees as they ascend. And as we continue thudding, careful watch should be kept for the queen, who will generally be espied eagerly seeking security by clambering amongst her retreating children, which make no attempt to escape by the opening between the hives, nor do they at all threaten to use their stings. They are both gorged and terror-struck, and in these circumstances are as harmless as flies. Generally speaking, even the veil is quite unnecessary in drumming, although the beginner should use one.

Mr. Pettigrew has wisely pointed out that, if the weather be cool, the skep into which the stock is to be driven should be warmed; and to this we will add the suggestion, which experience has shown us to be of considerable value, that in cool weather or where honey is not abundant, the bee should be sprinkled with warm thin syrup about a quarter of an hour before attempting to drive. This syrup should contain not more than a pound of sugar to a pint of water (if thicker it would be likely to glue the bees together), and of this a gill will be sufficient for a large stock. For

this sprinkling, a wine bottle, having a notch cut in the cork after the plan of the vinegar bottle upon the stall of the itinerant shellfish monger, will be very convenient, and enable the operator to drop with measured force the sweet libations between the combs.

In open driving, the skeps need not be of the same diameter; indeed, on one occasion, we found ourselves on a visit where a few stocks of bees were kept, and having consented to make an artificial swarm to fill a wooden hive with a fixed bottom, we could discover nothing better to receive the bees than a lady's chip bonnet box. The inside was well scored with a pen-knife to give the swarm foothold, and in a few minutes the whole was with perfect success accomplished.

Box hives, we are often told, cannot be driven, but if the bees be prepared as we have explained, getting them both gorged and warm, a box can be cleared of its bees in a few minutes. Indeed, drumming for twenty minutes upon a hive, caught up immediately after smoking, will not usually drive as many bees as two minutes' drumming will dislodge from one in proper condition. A well-known writer on apicultural matters tells us that the bees run up to escape the distressing jarring of their combs, kept up by beating upon their hive walls. Were this exactly correct, we think they would run down to the hive crown, where the combs are attached, and where, consequently, the jar is the least, and the relative distances of the comb not interfered with. We take it to be simple matter of instinct; frightened bees instinctively run *upwards*, and so retreat normally from the edges and exposed portions of their combs. We cheat them while drumming by inverting the order of things. If a skep be rapped a few times with a stick, the bees will be found, if we lift it, to have run up, and to be filling themselves from the open honey cells. With the skep, the impossibility of removing its crown is the only impediment to its being drummed *in situ*, as the following example will illustrate: One of our swarms in 1871 built so irregularly in an ordinary Woodbury hive, that the removal of any single comb was impracticable. In order to accomplish the re-arrangement of the interior, it was essential to lift out all the combs and frames in one piece, and this necessitated the previous removal of the bees. The crown board was taken off, the colony gorged, and an empty Woodbury, without its bottom board, placed upon it. A few minutes rapping sent almost every bee into the upper hive, which, with its forced swarm, occupied the old stand, while the straightening process was in progress.

We have said that beating upon the hive from "one to five minutes" will cause the bees to ascend, but with very weak and poor stocks, or in cold weather, this time is often much exceeded, and sometimes with a conjunction of the unfavourable conditions stated, the bees utterly refuse to leave; in this case they may be got out by throwing. The skep is held between the hands at the rim, the fingers within and the thumbs without, when,

by a decided downward jerk, the most of them will be at once dislodged. Give them no time to recover their astonishment, but repeat the process and after three or four shakes, hardly a bee will remain. Of course a sheet must be spread to receive them, but the method of treatment will depend upon our object. It is at all times difficult to drive from hives but partially filled with comb, since the bees cluster in its unoccupied parts rather than leave; while the attempt must not be made with very young colonies whose combs are so tender that breakage must follow the necessary beating.

We must also caution against driving after hot days, when much honey has been gathered, or this will commence to run from the combs as soon as the skep is inverted, while our jarring will so shake it out that the bees may be hopelessly glued together, from which cause not only may we fail in obtaining a forced swarm, but the colony will be damaged, and perhaps, even the queen killed. Let us attempt the operation on the following morning, when the limpid newly-gathered honey will have considerably thickened by evaporation, and further the process of sealing, *i.e.*, the capping of the store cells with their waxen lids, will have progressed during the night, while also the temperature will have dropped, making the combs less liable to collapse



CHAPTER VII.



ARTIFICIAL SWARMING.

NATURAL SWARMING INCONVENIENT—ARTIFICIAL SWARMING OF SINGLE SKEP — FINDING THE QUEEN — APPORTIONING THE BEES—THREE OUT OF TWO—MANAGEMENT OF STATIONS—INSERTING QUEEN CELLS — MAKING SWARMS FROM FRAME HIVES FOR PACKING—FOR THE APIARY—BRUSHING BEES—GENERAL PRINCIPLES.

THE bees' natural means of increase, "swarming," demands so much time, and is accompanied by so much uncertainty and inconvenience, that but few apiculturists nowadays have not taken the matter altogether into their own hands, increasing the number of their colonies by a variety of methods called generally "artificial swarming."

It is needless to point out that, left to themselves, swarms now and again settle in most inconvenient positions, or come off at most inconvenient times, or are lost by leaving when no watcher is at hand; while bees often idle week after week in big clusters at their hive door, and swarm not; and that sometimes unfavourable weather, after all things are ready, keeps the queen back until the princess intended to succeed her is necessarily destroyed.

We will at once explain the most generally suitable methods of procedure, asking the reader to carefully note the few *principles* given towards the end of the chapter, which will enable him to judge of suitability of season, ripeness of hive for increase, &c.

SWARMING A SINGLE SKEP.

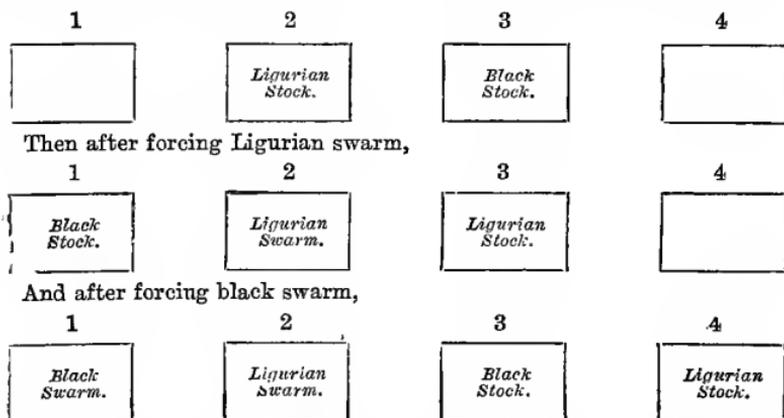
Having given a puff of smoke, remove it from its stand, upon which place an empty decoy skep to receive and amuse the bees returning from the fields. Drum the stock (see last chapter), and watch carefully for the ascent of the queen. A quick eye will rarely allow her to pass unnoticed, but if she has not been seen, turn over the hive containing the swarm (technically the forced swarm), for an examination, and if her majesty does not shew herself shake the bees sharply round, when they will roll over each other like so many grocer's currants, and the object of our search will probably

be thrown to the top and detected amongst them. As they crawl (for they will not fly) up the side of the hive, and cluster thickly upon it, beat them down by a sharp rap on the outside of it. Repeating the operation a few times, we can hardly fail in discovering, if present, the mother, in spite of her attempts at concealment behind her retreating children. The queen being found, place the forced swarm upon the old stand, and shake out the bees that have in the meantime returned to the decoy hive from the fields, when they will enter their new abode, and, finding their queen, will, with the rest, commence comb building at once, as would a natural swarm. The old hive must now be placed on a new stand. To the inexperienced, there are two possible difficulties about which a word or two of explanation seems requisite. First, finding the queen : Some are not quick at this ; and since the queen does not invariably rise by drumming, while her presence is absolutely essential to the swarm, such must depend on other evidence than that of sight. The forced swarm being placed on the stand, if tolerably quiet in the space of half an hour, the bees not rushing wildly in and out the hive, nor running over it apparently in search for something, it may be concluded that the queen is with them. But if their excitement is great, while the driven hive which may have been placed on a new stand not less than six yards away, is quiet, the evidence is unfavourable, when the driven hive may be again drummed, or the bees returned to the old stock for another attempt the following day. The second difficulty is leaving in the old stock the fitting number of bees for carrying on the work of the colony, and raising queens. This is best managed by arranging the positions of the stock and swarm. If not more than half the bees have been driven from the old stock, it must occupy a new position, and the swarm take its former place, to which, from force of habit, many of the bees still left in the stock will come after their first flight ; but if the stock has been driven very bare of bees, it is well to place the swarm and stock on opposite sides of the old position occupied by the colony, and each about 4ft. or 5ft. from it, so that bees returning from the fields may be as likely to enter the one as the other. Should the stock appear to be getting more than the necessary number of bees, disguise it by some cover, or place it farther from the old position ; but if less, bring it rather nearer to it. The beginner should try his hand at this matter not too late in the day, for reasons now obvious. Striving to anticipate difficulties has perhaps made the operation appear more formidable than it really is. Let all be done without flurry, and even the merest novice will find it become easy and clear as he progresses. If the driven swarm is to be sent away, pack it as described under "Natural Swarming," and out the stock on its own stand.

THREE OUT OF TWO

Where two or more hives are possessed, this method may frequently be

found preferable to the one just noticed, for the owner may desire an early and strong swarm, while his bees, although prospering, are hardly numerous enough to supply him with one. In the morning of a day when the honey gatherers are flying strongly, drum every inhabitant from the stock selected to supply the swarm. Place this swarm on the stand of the parent stock, and place the parent stock on the stand of a second hive, removing the latter to a new position. All the bees of the parent will remain with the driven swarm. The bees in flight from the second stock people the parent hive, feed the brood, maintain the heat, and raise a new queen; while in the second stock, the young bees not yet engaged in honey gathering will be sufficient in numbers to carry on its work. This method is suitable to frame hives as well as skeps; if drumming be replaced by shaking, as presently explained. Suppose a beekeeper to possess a Ligurian and a black stock, driving all the Ligurians, and placing their hive upon the stand of the black stock, half the blacks become nurses for raising a Ligurian queen, while the black stock will, in a few days, be as strong as ever, and, at the expiration of ten days, may he itself swarmed, when it will be placed on the stand then occupied by the first parent stock referred to, which will in turn go to a new position. To make the matter clear, let 1, 2, 3, 4, represent four stations, of which 2, 3 are occupied as below:



One great advantage of this arrangement is in this, that at the expiration of ten days after the first swarming, the Ligurian stock on stand 3 will have finished queen cells, only one of which will be required for itself, a surplus one may then be cut out and given to the black stock, which will in consequence have a breeding queen ten days earlier than if left unhelped; and, as in the early summer, 2000 eggs and even more are laid daily, this would be equal to a swarm. The queen cells are generally upon the lower edge of the comb, and may be easily taken out even of a skep by

cutting away with it, with a thin sharp penknife, about a square inch of comb, while the bees are kept in check by a little smoke.

There is some difficulty in inserting queen cells into skeps, they must be placed in the midst of the brood if possible. By separating the combs a little, one may be passed between them, and simply held by their grip; or it may be pinned in by strong pins running through the comb attached to it, or it may be put in at the feed hole, between the combs, room being cut out for it. The position in which it stands is not material, it will hatch on its side, or upside down, but the cell itself must be free to give the queen an exit. The operator must be careful not to pinch the cell, especially towards the end, or the soft-bodied grub will most likely be fatally injured. Indeed it is not safe, even with the most careful handling, to transfer until near the time of hatching, which may be known by the bees thinning down and roughening the cell at the end. This ripe condition is often reached by the 10th day after artificial swarming, but frequently we may have to wait to the 13th or 14th, watching carefully, or the object of our solicitude may get destroyed through a queen escaping from a cell we overlooked. In frame hives, cut a hole amongst the brood as in Fig. 31, and dovetail the cell in, when the bees will soon fix it neatly. You see here that a brood comb is selected, the lighter cells are those sealed, and in which the pupæ* are maturing, while from the darker vacant ones the bees have already hatched. A queen cell so situated is certain of being kept warm by the bees clustering on the brood.

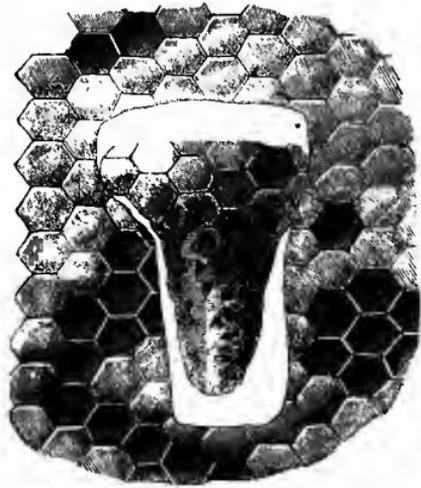


FIG. 31. INSERTED QUEEN CELL.

Plans only possible with frame hives now demand attention. Let us suppose we have sold a swarm and intend sending it packed in a skep. We remove, towards evening, the frame hive 3yds. or 4yds. from its stand, upon which we place a large flat board, as seen in Fig. 32, and upon this, towards the back, we place the skep to receive the bees, and prop up its front edge with the stone A. Open the frame hive, using smoke first to induce the bees to gorge, and then lift out frame after frame, searching for the queen. When we have found her, she is gently lifted off by the thumb and finger, taking her by the roots of the wings, and placed in the skep, which we raise

* The condition preceding the last change, when the insect becomes mature.

for a moment to enable us to insert her. The frame, now held by its ears, is sharply jerked in front of the skep, when most of the bees fall, and begin running in, when they at once cluster around their queen. This frame is returned to its place, and the process continued with others, until a sufficient number of bees have been obtained to form a swarm. Closing the frame hive, the swarm is made, and the process so far complete should not have occupied more than a quarter of an hour. Late in the evening we pack our swarm (see "Natural Swarming") and return the frame hive to its old position. Or, commencing early in the day, when the bees are flying strongly, we proceed as before, except that we shake off bees from two combs only, the foragers returning from the fields making up the necessary number, but in this case the stock should be removed if convenient, eight, or ten yards, while the swarm must not be made close

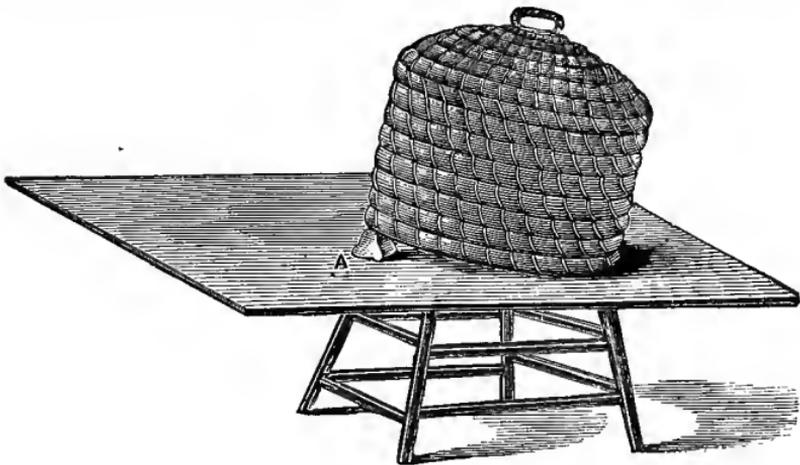


FIG. 32. SWARMING BOARD.

to other hives like the one from which it was taken, or many bees will enter the wrong ones.

If the swarm is to tenant a movable comb hive, the mouth is opened to the fullest extent, with the swarming board simply fitted under the alighting board, when all proceeds as before; or the frame hive may stand, propped up, without its bottom board, where we find the skep in Fig. 32.

If the swarm is to remain in our apiary, we may, in the morning, when the bees are in full flight, remove from the hive to be swarmed a frame containing brood, and upon which the queen is found or placed. Putting this into a new hive stood in the place of the parent stock, the flying bees will constitute the swarm, which will be strengthened by the hatching brood, while the queen will from the first have cells in which to deposit eggs. The old hive must go to a new station after we have drawn its

combs together to fill the gap made, and nearly closed its mouth to prevent its being attacked by robbers.

In making three out of two, no further explanation is necessary than that given under that head, except that to clear off all the bees, a goose wing or a gilder's large flat sizing brush must be used. Whisking or brushing off the bees is better than shaking when the combs are tender, or after a day of honey gathering, as most of the honey, if limpid, is jerked out, clogging the poor fugitives, especially the younger ones. Swarms may be made by taking two combs from each of four or five strong stocks, clearing off their bees, being cautious, too, that no queen is lost, and putting these into a new hive on the stand of a strong stock. The bees entering will raise a queen, while if empty frames be given to the colonies which have lost the combs, they will quickly refill them.

Our limits forbid a further detail of methods, which may be varied almost *ad infinitum*, the intelligent beekeeper constantly finding some specialty inviting a partial departure from stereotyped courses; but if tempted to experiment, let us remember that artificial swarming will not be successful if unnatural; we must conform to the conditions made necessary by the instincts and economy of the bee. This has been forgotten by some who have written on the subject, and plans have been given, which we are told are "easy and simple;" but from the reason stated above, are certainly not likely to produce good results; for example, a book largely read, tells us that we may make a swarm if we use frame hives by removing a comb containing grubs and eggs, and placing it in a similar hive to the one from which it was taken, afterwards removing the stock to a distance, and putting the new hive in its place. The bees, returning from the fields, will enter the old hive on the old stand, form a swarm, and raise a queen from the eggs given them. All this is true; but as it is an instinct of the bee to build only drone comb while possessing an immature queen, the hive will be nearly filled of that which can be used only for store or for raising a horde of useless consumers. Such artificial swarming *must* fail, whilst at the door of incompetent advisers lies the blame of the bad repute which the system has sometimes received. For the benefit of the more enterprising of our readers, we append a few general principles, by which they may do well to test any plan before putting it into execution.

1. No swarming before drones are rather numerous, or when patches of drone brood are not already sealed. The old stock loses its queen, and the drone will be needed for her successor in about twenty-three days; Exception: when we have a fertile mother to give to the old stock.
2. No swarming when honey is not abundant; the swarm has no capital, and an empty house. Unless it obtains large supplies, it

- cannot build comb, and is liable to starve; Exception: when we feed constantly, or supply stored combs to the swarm.
3. Comb building must not be left to a swarm with an immature queen, or drone comb only will be constructed.
 4. The driven swarm must occupy the old stand, or be sent to a new locality not less than one or two miles off. We have known of drones returning four miles. A natural swarm may be placed in any position, and the bees will keep to it.
 5. Driven swarms, if left on stand without a queen, will disperse amongst the neighboring hives. If a piece of comb containing brood be given, the bees will remain.
 6. Swarm from your *best* stocks. This is a golden rule, and too often quite forgotten. Remember, you thus get a good queen for the swarm, and her qualities will be continued in her successor in the stock. Artificially swarming a hive that never would swarm naturally, is often reversing Nature's law of "choosing the best," perpetuating only the progeny of a weak and effete queen, and the apiary is kept under a star of ill omen in consequence.
 7. Close partially the mouths of stocks that have been forced (*i.e.* swarmed)—they are weak, and are likely to suffer from chill; they are also queenless, and are liable to attacks from robbers.
 8. If from an oversight, a stock is left too bare of bees, it should be fed with sweetened water, and may with certain precautions be completely confined to its hive (see "Uniting").

Make an artificial swarm from a really good stock, ten or eleven days before swarming several other hives, and insert the queen cells in the latter, leaving one only in the selected stock. As queens begin ovipositing usually at nine days old, breeding will not be suspended more than about eleven days, which is four or five days less than in natural swarming, an immense advantage, in addition to which casting is prevented.

Natural swarming may be prevented, by clipping the queen's wings on one or both sides. An attempt at colonizing may be made, but the queen will fall on the ground, and the bees will return. If this course is adopted, a board must be placed aslant from the alighting board to the ground, by which the queen also may regain her home, or a succession of casts beginning nine days after, make the remedy worse than the disease

CHAPTER VIII.

TREATMENT OF SWARMS AND STOCKS.

SWARMS REQUIRE FEEDING—THE SOURCE OF WAX—RECIPE FOR BEE FOOD—HOW TO FEED—BOTTLE COVERS—GUIDE FOR SKEPS—UTILISING OLD COMB—PLANE GUIDES—EMBOSSSED SHEET—LONG'S FOUNDATIONS—CHESHIRE'S GUIDES AND MIDRIBS—DRONE MIDRIBS—DRONE TRAPS—ROBBING—BEE HOUSES—PASTURAGE—SPRING AND AUTUMN FEEDING—WATER—ARTIFICIAL POLLEN—UNITING.

It is important to feed swarms started with empty hives, even in good weather, but it is absolutely essential to do so in bad, as the following considerations will clearly show: The bees are no sooner fairly hived, than they form in cluster and keep up a high temperature in order to secrete wax, which is produced from eight glands situated in the reflexed parts of the under side of the abdominal rings of the worker; whence, if we use frame hives, it may often be seen projecting in little rhomboidal plates, looking like scale armour. These are, by the aid of the mandibles, elaborated into comb in a manner upon which space forbids us to dilate. The wax is a species of animal fat, the evolution of a pound of which requires the consumption of nearly 20lb. of honey, or some similar saccharine substance. As 2lb. of wax at least are required to furnish a hive, we see the great quantity of honey demanded if the bees are unassisted; and should supplies come in slowly, comb binding proceeds sluggishly, breeding is hindered, and the discouraged bees lose that eager earnestness which always at first characterises a swarm. Feed regularly and liberally until the hive is furnished with as much comb as the swarm can thoroughly cover, and then treat according to weather.

The best food for swarms is loaf sugar, 3½lb. boiled in a quart of water (the syrup should be stronger for autumn feeding), to which is added, whilst boiling, a tablespoonful of common vinegar, after which, the boiling is continued ten minutes. Good authorities have said the vinegar is not required, but we beg strongly to differ, having seen again and again the inconvenience to the beekeeper, and the disadvantage

to the bees of feeding with crystallizable sugar, which cane sugar is. The vinegar converts the cane (grocer's sugar), into glucose or sugar resembling that of honey, which thickens rather than crystallizes, as

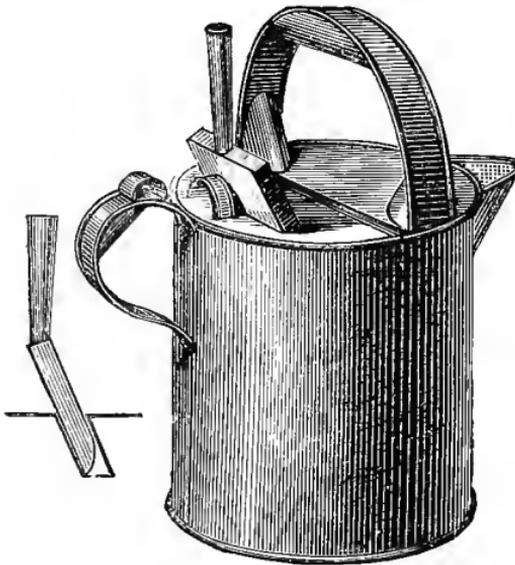


FIG. 33. SHOVEL AND SYRUP CAN.

bottle (such as used for pickles) is now filled; the shovel is placed over its mouth, and the whole inverted (Fig. 34), when not a drop of the

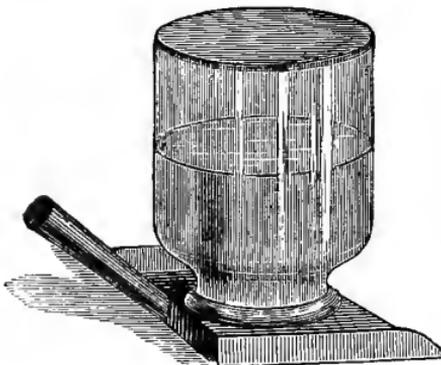


FIG. 34.

comfort, may use a piece of tin turned up at the end, or canvas can be tied over the mouth of the bottle, and the latter inverted as before; but

its water dries out of it. We recommend the syrup to be so kept that the entrance of the bees will be effectually prevented, or terrible destruction may result. Some such vessel as our prize syrup can (Fig. 33), in which the spout is covered with perforated zinc, while the shovel, of which presently we shall see the use, drops into a perforated well, will prevent all danger. Over the feed hole of the hive we fix either our prize vulcanite feeding stage (see *infra*), or a piece of fine (No. 6) perforated zinc. A wide mouthed

bottle (such as used for pickles) is now filled; the shovel is placed over its mouth, and the whole inverted (Fig. 34), when not a drop of the syrup escapes. Placing the shovel over the feeding stage, the bottle is held by one hand, and the shovel quickly slid away from under it by the other, when the syrup is taken by the bees thrusting their proboscides up into it through the perforations. The supply of syrup should be given in the evening just after the bees have ceased flying, as less excitement will thus be occasioned. In lieu of the shovel we, though with less

this plan is less perfect and more troublesome than the previous one. It is most important that no bees be admitted from other hives to regale themselves around the bottle. Our hive covers should be made, if possible, proof against them, but in cases where these have been wanting, we have had made a little canvas or calico bag large enough to slip over the feeding bottle easily, and have sewn into its hem a child's large bead necklace which costs 1*d.*, and this cover at once so fits itself to the hive top, that no inquiring bee can steal a single sip. Ten or twelve such bags about an apiary would often save trouble from robbing, so likely to follow the discovery of ill-protected sweets. It may seem strange, but it is really true, that if a swarm be judiciously fed, it will do much better for some days if the weather be very bad, than if it be fine. In the first case all the bees remain at home feeding, and comb-building; while, if the weather entice them, their energies and time also are partially consumed abroad. Few have yet forgotten the wretched wet spell during lime blossom in 1875. The day before it set in, we had a fine cast which was fed constantly, and had pea-flower (See "Artificial Pollen") given to it at the hive door, when it made, during weather such as we rarely see, most unusually rapid progress; neglect would have so disheartened a swarm similarly circumstanced, that it would have done little when sunshine returned.

Sticks running through skeps are recommended by some straw hivists, rightly, as we think, from the fixist's point of view; these should all run one way, so as to be at right angles to the comb. Direction is given to the building of the bees, by placing in the skep a guide, that is, a narrow piece of toughish comb, which can be fixed to a slip of thin wood, which in turn can be nailed to the skep crown, we prefer, as neater, painting the part to which the guide is to be attached three or four times with wax, and then, while the wax is still liquid, pressing the guide well on to it, holding it till it is secure. If sticks are to be used, we must, in making forced swarms, drive into a hive without sticks, and transfer the bees, as the former would considerably impede our search for the queen.

Those who adopt the movable comb system can utilize any waste pieces of worker comb by fixing them to the bars of the frames, when they not only act as guides, but assist the bees. To attach them, invert the frame, paint it well with wax, which heat again with a hot iron, and press the comb into its place.* The top of the comb should first be made flat by cutting with a knife, or rubbing upon an inverted heated laundry iron.

The movable comb system necessitates straight building. In reference to this matter, as the whole working of the apiary depends

* In France and Germany common glue is often used for this purpose. The process is most simple: Glueing the frame and dipping the comb, and then bringing the two into contact, being all that is necessary. The bees treat the glue as propolis, and complete the fixing to their own taste.

upon it, we must give some detailed directions : The position of the hive is important ; let it stand horizontal in front, and raised an inch or two at the back. If the bars are of the Woodbury pattern (Fig. 13, page 14), or are made like

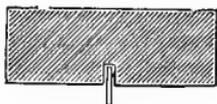


FIG. 35.

Fig. 35, representing the cross section, the projection beneath (in the latter case consisting of a thick shaving inserted in a saw kerf) must be carefully painted with clean wax, which is best melted in a pot resembling a carpenter's gluepot. The bees so far assisted would commence building regularly, but a swarm often, a cast generally, takes up its position at the side of its domicile, and beginning there to build, brings its outside comb into the centre of the hive. This outside comb devoted to store, as it naturally will be, is often so thick as to encroach upon the bar lying beyond it, and when the bees begin to multiply and fill new frames the cards will necessarily be irregular. To overcome this difficulty, insert one of the empty frames in the centre of the brood nest, between the most regular of the constructed combs, as the bees are able to occupy new ground, and push the thickened store comb by degrees to its true position at the side of the hive. Not only will this prevent irregularity, but your interference will produce good results, the reasons for which are already given at page 19. The work of a swarm should be looked at a few days after hiving, when a little attention will often prevent subsequent annoyance. A comb flowing from the line may be cut with a keen knife, pressed into position, and held by a lead or zinc clip, till the busy throng has made it again secure.

The plan of starting the bees by a line of wax left by painting the bar, and then scraping all away by a gauge, consisting of a piece of metal with a notch cut in it, must now be regarded as out of date, being both very troublesome and unsatisfactory. An immensely better guide can be made much more quickly thus :

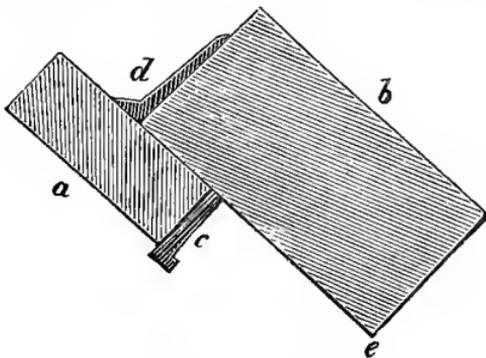


FIG. 36. GUIDE MAKER.

Prepare a slip of soft wood, free from knots, about $\frac{1}{4}$ in. thick, and of

the length between the sides of the frames to be waxed, and drive into it two brads at bare 7-16ths inch from its edge; soak this slip thoroughly and it is ready for use. Place it upon the under side of the top bar, allowing the brads to act as a stop; it will cover half the width of the bar, which is made 7-8ths wide. Upon the exposed half, and upon the side of the wetted slip, paint perfectly clean molten wax, draw the brush over it with a fresh supply (about twice. The wax will adhere to the bar with great tenacity, but upon the removal of the slip, no attachment will be found to have taken place, and the wax applied will remain like a thin wall which will be modelled by the bees into the midrib of their combs. Instead of applying the wax with a brush, it may be poured on from a spoon, when the bar and slip should be held so as to form the sides of a little trough or gutter, along which the wax should be allowed to flow. This will be best understood by reference to Fig. 36, where *a* represents the top bar in section, *b* the wetted slip, *c* the brad acting as a stop, and *d* the wax guide. If the distance *c e* be made half the width of the super bars, the slip *b* will do duty for supers as well as hives by simply turning it round. If combs can be spared sufficient to fill every alternate frame, irregularity will be impossible, and the furnished frames may be removed to do duty with another swarm as soon as a start has been made.

Embossed wax sheet is largely used by some beekeepers, and is thus made: A dipper of pine, having surfaces of the dimensions of the sheets required, is soaked well in cold water, and then plunged into clean molten wax, which is solidified by the contact of the cold wood in the form of a thin plate, which remains upon it (*i.e.* the wood) as it is withdrawn. Plunging the dipper again into cold water, and repeating the waxing, will make the sheet of about the required thickness, when it can be lifted from the dipper, like a piece of thick paper. The sheets are now pressed between a pair of metal plates, modelled to the exact pattern of the midrib of comb. To emboss the sheets with ease, it is well to keep them in warm water until placing them between the plates. The artificial midrib is now cut to the required size, and fixed in position, generally by placing its edge in a saw kerf, and running or brushing in melted wax to hold it. Our readers are referred for more detailed directions to what we have written in the columns of the *Country* and elsewhere upon this matter. We regret little that space necessitates brevity here, as some new methods will, we think, ere long bring embossed wax sheet into disuse. The Americans are now employing a wax sheet called "Long's Foundations," made with most beautiful finish, by a machine costing about £30, carrying two embossed drums, between which the wax passes like a cloth through a patent mangle. The edges of the bases of the cells are thickened, so that a supply of wax is already at hand for the bees to use in constructing the cell walls. These foundations require fixing, and

in this are not equal, although in appearance they are much superior to the sheets produced by our new method of making guides, for which the first requisite is a plaster model or mould, which may be made either from the embossed plate, or from natural comb. To make the cast from the embossed plate, proceed thus: Dab the latter with a piece of sponge or rag which has been sparingly moistened with paraffin oil. Then place over the plate (*o p* Fig. 37) a wooden frame, oiled well, to prevent sticking of the plaster, and $1\frac{1}{2}$ in. deep and wide. We see the sides of this frame at *q r*. Now mix a very thin paste of super plaster, the kind used by dentists for modelling, and pour it into the trough, fill it up with stiffer plaster (*s*), and strike it off level at top. Having now our plaster model, it is only necessary, in order to make the guide, to well soak the former in water, and place against its side, the top bar of the frame, so

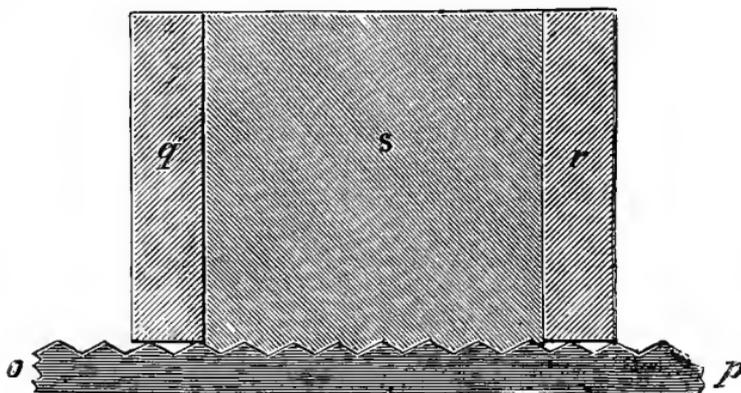


FIG. 37. PLASTER MOULD FOR THE CHESHIRE GUIDE MAKER.

that the centre of it lies along the edge of the cast. Pure wax having been melted, as we have often explained, in a gluepot, it is applied by a painter's common brush to the top of the cast, and the exposed part of the bar. The wet plaster receives a coating, which immediately sets, but does not adhere, while the wax incorporates itself with the wood, which when raised, carries a guide most firmly attached and as straight as an arrow. The little apparatus (Fig. 38), which was used at the Crystal Palace Show, and to which a silver medal was awarded, will enable us to work more agreeably and expeditiously. To about a square foot of inch stuff (*u, v*), an upright (*t*) $2\frac{1}{2}$ in. high, is fixed: holes are pierced at various heights through this to receive two iron pins, one of which is seen at *x*. A shallow tin tray (1, 2) holding water (3) has the plaster cast (*u*) stood in it, when capillary attraction carries up the exact amount of water necessary to prevent adhesion of the wax. The pins having been adjusted, so as to bring the centre of the bar (*y*), opposite to the top of the mould, the latter

is pushed into contact with the former, and the wax brushed on as before. A dabbing motion with the brush produces the best impression, which, by a little practice may be made astonishingly perfect. In waxing frames, a

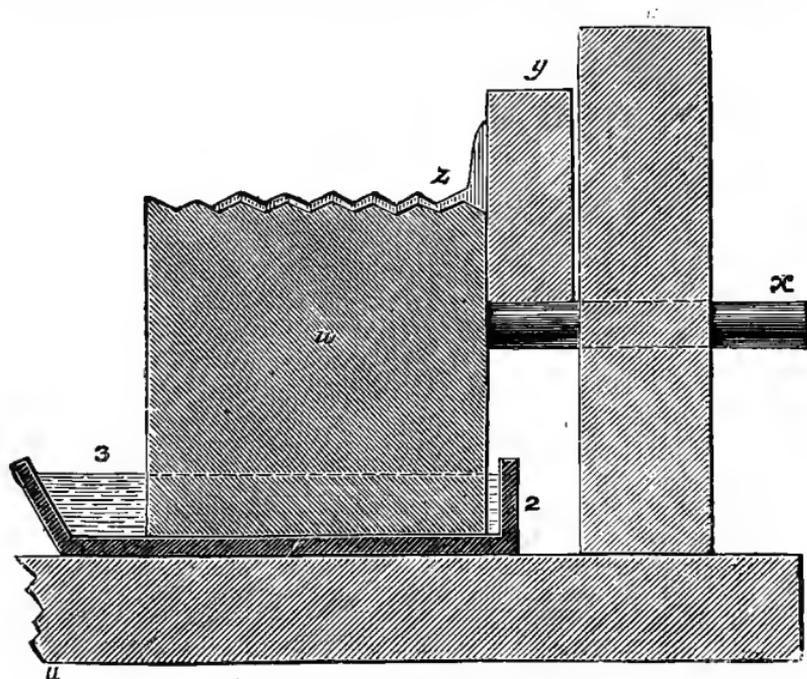


FIG. 38. THE CHESHIRE GUIDE MAKER.

prop or wedge should be placed under the bottom bar, or *y* will not stand in a perpendicular position; before raising the frame, the prop should be removed. Instead of the pins, two screws standing between 2 and the upright piece are perhaps more convenient, as they can be turned in and out,

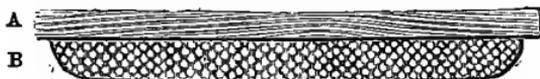


FIG. 39. THE GUIDE.

so as to adjust the height of the bar (*y*) to the greatest nicety. The guide (*z*) should be finished by being cut with a pair of scissors to about the form shown at Fig. 39, where A represents the bar, and B the guide. The casts and guide also may be increased in width, but if our object be merely to secure straight combs, $1\frac{1}{2}$ in. is more than sufficient; but if we desire to determine for our bees whether they shall construct worker or drone cells at the same time that we help by providing them with material, we should recommend moulds to be made from natural comb, by the following

plan, which we did not reach till many partial failures. Select a straight, old, and large comb, containing no drone cells, free from honey, and, if possible, from pollen also. These conditions can be nearly, if not quite absolutely reached by the owner of three or four movable comb hives, if he select a card of comb in the early spring. With an old sharp dinner knife dipped in hot soapy water, pare away the cell walls from the more perfect side of the comb, until it is found that the chrysalis cases begin to tear, and make the work untidy; now pour some melted tallow or dripping into the cells, and allow it to set; bend the end of the knife, so as to make it like that used for uncapping (see "Extractor"), keep its edge keen by rubbing upon a hone, and now continue the operation of cutting away the cell walls, when it will be found that the tallow will hold the old pupæ skins against the knife, and all will proceed with perfect smoothness; cut carefully as you approach the midrib; your warning will be the apparent thickening of the partition between the cells. The work so far complete, turn the comb over upon a *flat* board, and remove as much of the partitioning on the other side as you can without risk. Place the comb before the fire, not near enough to at all endanger its melting, but merely to soften it, so that it may sink down upon the face of the board, and give us bye-and-bye, a perfectly true and level mould. Pour thin plaster of Paris over the back, so as to fill every cell as completely as possible. The plaster having set, our work, now flat and stiff, may be lifted, when we have to remove the tallow filling the bases of the cells. Place the comb at an angle in a sink, and pour over it, in a thin stream, hot water (about 130°; wax melts at 150°) allowing it to fall two or three feet. The heat will melt the tallow, while the gentle blow will drive it out, at the same time leaving our mould so far finished. The cast is to be taken from it, as from the metal plate previously referred to, not omitting the dabbing with paraffin. We may be unable (we have been) to obtain a comb large enough to make a midrib for a whole frame; if so, make two casts,* each about half-an-inch thick, rub or saw those edges which you intend fitting together, so as to have a good join. Turn them on their faces, bring close, and then make up the plaster at the back over both to one and a half inches. This mould must then be cut to size, and used after careful soaking, like the cast *u* (Fig. 38), gently dabbing it with a wet sponge after each sheet made. The impression will be much more deeply cut than that obtained from the metal die; and, in addition, making the mould from *old* comb will so thicken the portion of cell-wall given, as to supply material for its elongation, while the size will be necessarily exact, which is unfortunately not the case with the German plates, these giving fifteen and a half cells in three linear inches, while a large number of combs we have measured, give an average of fourteen and a half cells only in the

* Any number may be made when the matrix is once prepared.

same length. This error close observation shows to have much hindered bees in working with impressed sheet. We have had these midribs converted in stocks into most perfect combs in twenty hours, besides having a large number of eggs laid in the cells, while the bees are forced to exactly follow the pattern, and even show the line of the join we have been obliged to make; and a swarm have worked them perfectly when they have been supplied in every frame 6in. deep. If the upper side of the midrib in making is clumsily brushed on, so as to obliterate the form, the bees seem much puzzled in executing the cells, which they delay in beginning, and start from the bottom, working upwards; the side which stood next the plaster being completed notwithstanding. We think this proves, if proof were wanting, that plain sheet is in no way equal to embossed. The work can be best performed in a warm room with the mould soaked in tepid water, and the wax several degrees above melting point, we thus get more time for laying on. Every beekeeper will see the advantage thus gained in preventing the production of a useless horde of consumers, by limiting the amount of drone comb in the body of the hive, while the advantages of obtaining for supers cells of the larger size is scarcely less apparent, since in these bees deposit no pollen, they are more quickly built, and require less wax in proportion to the honey stored. To set this pattern of cell in supers instead of working from natural comb as before, we have been driven, for reasons all good beekeepers will at once understand, to a little device. Procure sufficient $\frac{1}{4}$ in. shot to form a layer the size of the guide required; shake these into position upon a sheet of tin upon which has been soldered a thick wire to form a sort of tray. Place the whole upon a hot plate, and fill in the interstices to half the depth of the shot with hard paraffin (paraffin candle will suit capitally). Take a cast in plaster, which bake, and while hot soak with oil, tallow, or hard paraffin (the last is the best, as it makes the cast exceedingly tough). From this may be made any number of moulds in plaster, to be used with hot wax, as before explained. The objection to this plan is that the bees work one side of the sheet more regularly than the other; so we recommend as much better, while scarcely more troublesome, as follows: Drive the requisite number of shot called in the trade SSG through a quarter-inch hollow punch (1lb. is required for every 12 superficial inches of guide); place these in a frame of proper size and $\frac{1}{4}$ in. deep, formed by screwing slips on to an oak or beech board, and fix them by running hard paraffin between them by the aid of a hot iron. Take 3in.

or 4in. of iron rod and file its end thus  in three planes, finish

upon a hone, and it will resemble the bottom of a cell; and punch this

into each space between three shots. The mould will now be perfect, and the cast can be at once taken from it for use as before. If you prefer it, you may make a mould for cells worker size, also, by the former of these two methods, then use shot called AAA.

While experimenting upon substituting paraffin for wax for comb midribs we are pleased to learn that the whole thing has become an established fact. Mr. Root, the editor of *Gleanings in Bee Culture*, who had a machine for making "Long's Foundation," says, in his issue for June, 1876, "We have dispensed entirely with beeswax, paraffin being much cheaper, whiter, stronger, and more rapidly worked by the bees."

"In our experiments to determine what would give the paraffin the requisite elasticity, we went to the bees and were told they added propolis to their wax when they wanted it very strong, and as they would find it a hard matter to furnish as much white and tasteless propolis as our family will need, we bethought us of a favourite gum of our childhood—Burgundy pitch—and found that this, added to the paraffin in very small quantities, gives just the tenacity needed."

Drone Traps sometimes are of service to prevent the escape of black drones, whose presence is most unwelcome, when we are endeavouring to raise Ligurian queens, but it is poor management which allows of the unrestrained production of the rascals and then traps them. Instead, cut out all excess of drone comb, and graft worker into its place. Any ingenious beekeeper may construct a drone trap for himself; and, although to ours the palm has twice been awarded, we are free to admit that a common principle runs through all of them. The trap divides the exit from the hive into two, one apparent from within, because light enters by it, the other masked. The bees fly to the light, and pass out, as intended, through a tube, the end of which is in the centre of a chamber full of apertures, only large enough to pass a worker. The drones (more bulky) are thus imprisoned, as they try all corners for a way of escape, but are not clever enough to retrace their steps. The workers' after their flight, return by the masked opening, which is apparent from the outside.

Robbing never occurs when honey is very abundant; bees will not even notice it then in comb, however much it may be exposed; but in times of scarcity, when the weather allows the honey gatherers abroad, they are so eager to gain supplies that they often attempt to enter weak or queenless hives, to gain possession of its stores. Robbing is likely to be brought about by exposing sweets or feeding in such a manner that strangers can get access to the syrup given, but our calico covers will often prevent the source of mischief (see page 49). When a hive is attacked, the would-be thieves may be known by their buzzing around the hive door, when one and another of them now and again settle, generally to be seized by the

guards within, who often in serious tussle, fall with the enemy from the alighting board to the ground. So long as the colony is energetic in its defence, the danger is slight; unless, indeed, the besiegers gather in considerable numbers, when they should be well sprinkled with water, and the hive door reduced to about $\frac{1}{4}$ in. square, giving ventilation above as needed. If the assault continues, place a piece of tile on each side of the entrance, and another piece over, forming a little bridge, and sprinkle or sponge the front of the hive with carbolic acid and water. These means, with a little watching, will rarely fail, but if the colony be very weak, or has given up resistance before the discovery is made, it had better be taken to a new locality, or it may be closed (ample provision being made for ventilation), and placed for three or four days in a dark cellar, and fed upon thin syrup. When returned to its stand, aid it as previously directed, and in addition, lean a board against the hive front so as to conceal the absolute mouth. It has been remarked, that bees are somewhat like their masters, since, with them, a lapse into dishonest courses is not often followed by a return to virtue, and that bad example in the few tends to demoralize the many; for many a beekeeper has had to lament the loss of valuable stocks through his want of caution leading his pets into temptation.

Beehouses are not now used by our best apiarians. They make it impossible to operate with one hive without disturbing the rest, which sometimes starts robbing, they bring the hives so close together, that young queens returning from their nuptial excursion are likely to enter the wrong aperture, to be at once destroyed, while the hive which owned them dies out unless assisted, and they much interfere with some of the best methods of manipulating, as a glance at "Artificial Swarming" will show, but some of orderly mind would rather run a risk than make the garden

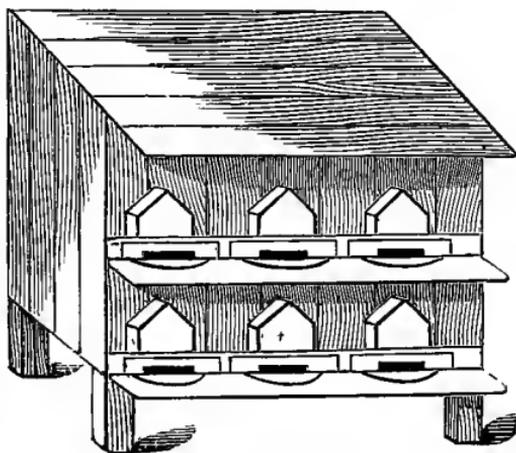


FIG. 40. BEE HOUSE (FRONT).

"untidy." Such may examine Figs. 40 and 41, representing the front and back of a bee house. Sir John Lubbock's experiments have demonstrated, that bees have a perception of colour; we may therefore minimize one of the risks indicated above, by giving the entrance ways different

hues. We would also recommend a leafy twig to be fixed over the alighting board of any stock that has swarmed until the young queen is known to have mated. Mr. Hooker, and Mr. Neighbour both make thin hives

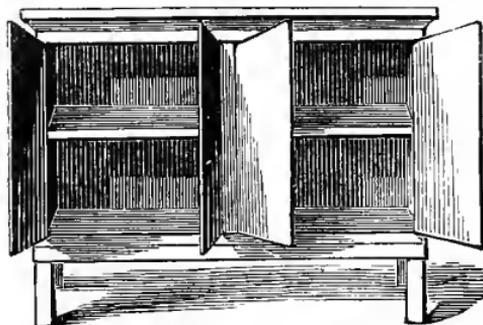


FIG. 41. BEE HOUSE (BACK).

to slip in and out of that which may be called a bee house for one colony, thus permitting of the moving of stocks from point to point, as occasion may require, without altering the arrangement to the eye.

Pasturage is good generally where orchard and forest trees abound, or in the neighbourhood of seed farms, or where white clover is cultivated, or wild flowers

and heath are abundant, and indifferent where much of the land is grazed—by sheep especially. A variety of honey-producing plants and trees is preferable to a great extent of one kind—securing succession, and prolonging the gathering season. The common idea that flower gardens are the bees' cornucopiæ, is totally erroneous, although it is true that stocks usually do fairly well where there is much villa gardening, because we here get variety, and consequent succession. Planting a few flowers near hives is scarcely more likely to increase the weight in our supers than growing wheat in a flower pot is likely to cheapen bread; but this is not saying that scattering seeds of such good honey plants as borage along the hedgerows near the apiary is not both wise and useful. The plants which grow close to the hive door are not much visited, as the instinct of the bee rightly leads it farther afield. If each seeker applied to the blooms nearest home, how much time would be lost in dipping into nectaries already rifled of their sweets!

Spring and Autumn Feeding are most important items of management. Strong stocks are not altogether without brood for about ten months during the year, but in the early spring the cautious insects, left to themselves, do not venture upon raising any considerable number of young bees until supplies come in in sufficient amount to warrant that heavy expenditure which rapid breeding demands. The supply once established breeding begins apace, but before the increasing circles of eggs can be converted into gathering bees a month must elapse, since the first few days of the newly hatched workers are passed within the hive. During this period the few bees that can be spared from a comparatively thin population, which has the duty of nursing and keeping warm a large number of grubs, can only most imperfectly take advantage of the

myriads of bloom which clothe with such unspeakable beauty our orchard trees. How then can we secure the abundance of labourers when the harvest is plenteous? By antedating the natural supply of honey by feeding—commencing if the weather is open, at the end of February. We may use any kind of feeder; but the bottle, as recommended at the beginning of the chapter, allows the bees to regale themselves while clustering in the warmest part of the hive, while no heated air is suffered to escape: advantages combined in no other form. But the bottle on perforated zinc is not the *ne plus ultra* of feeding. It lacks the gentle regularity of the normal inflow of Nature's sweets. It gives to the bees so rapidly that they, in their greed and excitement, fill up the cells of the brood nest, and before the stimulus for ovipositing has taken possession of them the supply is gone. To

overcome this difficulty we invented the rotating stage (Fig. 42), consisting of vulcanite, and having holes pierced in it, as in the illustration. Vulcanite is smooth and flexible, quite incapable of being chemically acted upon by any bee food, as zinc may be, and above all, is an exceedingly good non-conductor of heat. The plate is fixed upon the

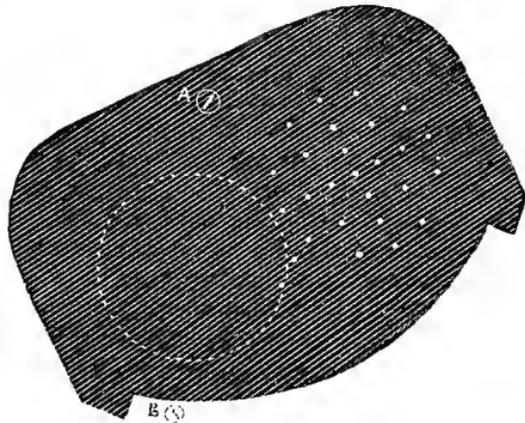


FIG. 42. CHESHIRE FEEDING STAGE.

(A), to receive which a hole is first made in the vulcanite with a red hot wire. The dotted circle shows the position of the feed hole, which should stand exactly between A and the stop (B), a locksmith's screw, so placed that its head laps over the edges of the plate and holds it in position, while it permits its rotation either way, until one of the two projections touches the screw. The plate may be pierced with a red hot knitting needle, the burrs removed by scraping, and the under side roughened by deep scratching with a sharp knife, so that the bees may have foothold. If the plate be placed as represented, only one hole would be reachable by the workers beneath, and this would be cut off from them if the plate were rotated as far as possible to the right, so that the bottle may remain on without giving anything to the stock. If, however, the movement be made towards the left, hole after hole is brought into position, until the maximum is reached, when the stop arrests the further rotation of the vulcanite. The effect

of slow and regular feeding is remarkable. Food comes in slowly, it is true, but the supply is constant; day by day the store increases, and the thrifty little insects come at last to trust in what appears a perennial spring. The natural result is the deposit of eggs, and the grubs in due course quickly consume the sugar supplied, so that we positively convert our food into bees. Two cautions are here needed: 1st. Do not use over large bottles for the syrup to be filled at long intervals, as some have recommended. Air expands and contracts greatly as its temperature rises and falls, and that standing above the syrup in a capacious bottle increasing in volume as the morning warms, will pour our food down over the bees, to their great injury, especially if the night has been cold. A bee-keeper of our acquaintance recently lost a stock from this cause. If a bottle half full be placed on the feed hole of a hive without bees, a few days will empty it, for the reason previously given. 2nd. Bees will often devour whole batches of eggs deposited under the stimulus of continuous feeding, if left without supplies even for a few hours. This is more particularly true when the weather is such as to confine them wholly to their hives. Taking this hint, those who really love their bees will feed them after thoroughly bad days all through the spring; and to the cottager who desires profit no investment would yield so large a return as this.

The principles already indicated as guiding "spring stimulation" apply to autumn feeding. Normally a hive should continue breeding, though with relaxed energy, until the dropping temperature reduces all to a condition of quiescence, and then the youngest inhabitants, with the initial energy of a new life, pass on at once into the hibernating condition, which conserves their forces almost unimpaired until the return of spring, for the life of a bee seems not measurable by length of days, being rather a constant quantity of nerve force which may be paid out rapidly or slowly; hence during the summer the workers' powers are worn out during five or six weeks, while from autumn to spring eight months are required to exhaust them. From this it will appear that an early failure of the honey harvest, stopping breeding prematurely, will deprive the hive of its main hope for the spring—comparatively fresh bees. These may be obtained by providing that stimulus—food—which nature fails to supply. But supply regularly and slowly, not fitfully, and breeding will be continued; and, if it be so desired, comb built long after the ordinary period. Our experiments upon this matter have been given at length in the columns of the *Country*. The result was in short to build up stocks from mere handfuls of bees, and keep them breeding freely and building worker comb far into the month of November.

If, however, our object be to supply that store which is needed to carry the stock through the winter, syrup may be given rapidly; but this, although made as before described, must not contain less than 5lb. loaf

sugar to a quart of water, so that little evaporation will be required before sealing. If quantities of thin food be given quickly late in the year, as some advise, the effect must be most prejudicial, and evidence is not wanting that dysentery is directly produced by it.

Water is an essential for bees. Wild ones are said never to be found but in the neighbourhood of some pond, brook, or spring. New honey is very dilute, containing all the water necessary for producing with pollen the chyle upon which the worker feeds the advancing grub (see p. 5), but it is never sealed until much inspissated. When brood has to be raised upon store, water is obviously required, and at such times the anxious workers may be seen flying in search of it, even when the temperature is so low as to make the death of many certain. This explains the philosophy of giving thin syrup in the spring, as previously advised. Unless some source render the arrangement unnecessary, place near the hives trays provided with wooden floats bored with holes, through which the bees may sip without danger of drowning. These will only be frequented during dry weather and when honey is scarce; but do not provide drink and when your bees have learned to trust to it forget its continuance.

Pollen, Natural and Artificial.—Natural pollen (the flesh-forming while honey is the heat-giving food of bees) is the dust gathered from the anthers of flowers and packed by the gatherers on the concave face of the tibia of the hind leg, where it may be seen in little rounded pellets of varying hues as the loaded labourers regain the door of home. The bee, having fixed herself upon a cell, pushes her burden from its position by the fore legs and then rams it down with the head. The cell having received its complement, a little honey is placed over it, and the waxen air-tight sealing added, which renders fermentation impossible. Mr. Pettigrew, whose practice is more accurate than his philosophy, tells us that "bees do not eat pollen. They die of starvation, with a superabundance of it in their hives;" but the latter fact does not prove the former statement. A man would die of starvation if fed only on Liebig's extract of meat on the one hand, or on arrowroot on the other; but by uniting the two he has a sufficient diet. So with the bee. With pollen only they would quickly die of cold; with honey alone tissue is soon exhausted and vital energy slowly but surely extinguished. The physiologist perfectly understands this matter, and has shown long since that a true proportion of the essential food of animals—flesh and heat formers—is necessary in order that the largest results may be obtained by any given consumption of them.

Artificial Pollen has been given by American bee-keepers, and latterly by many in England. The idea originated with the great observer Dzierzon. He noticed, very early one spring, that his

bees were carrying home flour which they had stolen from a neighbouring mill. He profited by the hint, and quickly gave the substance close at hand, with results highly satisfactory. And lack of wholesome pollen possibly often retards spring breeding, especially where sugar is being given, for do we not frequently find that the pollen of the autumn in the central combs has desiccated so as to be useless, while that of the outside ones has mildewed? One of the signs of returning activity will be the removal of the first-mentioned indurated masses which the bees, with their admirable perseverance, tug at and tease until they accomplish their dislodgement. The substitute for pollen usually given in America is unbolted rye flour. We have used pea flour with the greatest success. This substance is highly nitrogenous, and contains albuminoid compounds in considerable amount, and in this particular closely resembles natural pollen, and is capable consequently of being converted into animal tissue. Place the pea flour in trays covered from the rain, and sprinkle so well with chaff as nearly to cover it from view. The bees may be allured to it by a piece of old newly burnt comb; but ours want no invitation, rolling in it by thousands, and consume, when supplied, many pounds daily. When natural supplies are abundant the substitute is disregarded.

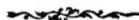
Uniting.—It is a cardinal rule in beekeeping, that stocks should be kept strong. Weak lots require much attention, for which they rarely pay in results. The nursing of weaklings seems to have a peculiar fascination for some, but in almost every case “le jeu ne vaut pas la chandelle.” In the early spring, if we find two weak stocks, one queenless perhaps, and we determine to unite them, we get them side by side by moving each about a yard daily. If they are in skeps sprinkle both well with weak syrup, scented with peppermint, smoke slightly the one to be driven, and more the one to receive the driven swarm. Wait ten or fifteen minutes before driving. Place the skep to be strengthened upon a large board (see Fig. 32) or a sheet; throw the forced swarm upon it; once more sprinkling gently, when the bees will be well received. Let this stock stand between the positions occupied by the two united. If the given bees have a queen, known to be old, remove her. For frame hives with interchangeable frames it is only necessary after smoking and sprinkling to take out vacant frames so as to give place to all those containing brood or carrying bees in the one hive; removing as before the queen least valued. If inconvenient to previously place the hives side by side as recommended above, the bees may be made to remain in their new station thus: Close* the hive during the two days succeeding the marriage, giving ample ventilation, and allow the bees to take a fly late in the afternoon by opening the hive before sunset

* Closed hives should have *thin* syrup given to them.

and closing it again before they are on the wing in the morning. On the third day the danger of desertion is passed. If the hives to be united have not the same sized frames, the bees should be brushed from all on to a sheet or board, allowing them to run in together, sprinkling if there be any disposition to quarrel; provided always that we have smoked, and, to be safe, scented them also. Bees are very olannish. We overcome them by fright, gorging, scenting and reducing to poverty, so that they have nothing to defend. Swarms or casts may be easily united, and without any preparation, if one has not come off more than a day or two before the other. If more time has elapsed smoke the older swarm, and well sprinkle the new comers: bees with well filled honey bags are commonly welcomed. In the autumn stocks too weak to winter may be strengthened by condemned bees (see Chap. 9), which, unfortunately, most cottagers are too ill instructed to utilize. The experienced might dispense with some of the precautions here advised, but we are writing for the learner, to whom "short cuts" would often prove the longest road.



CHAPTER IX.



SUPERING, EXTRACTING, AND HARVESTING.

STRAW AND GLASS SUPERS—JACKETS—FIXING COMBS—BAR SUPERS—GUIDES FOR DITTO—COWAN'S BOXES—ZINC ADAPTER—DIVISIONAL SUPERS—HIVES WHICH YIELD MOST SUPER HONEY—CAUTION IN REMOVING SUPERS—TAKING OFF SUPERS—CLEARING OF BEES—CHESHIRE PIN TRAP—EXTRACTOR—ITALIAN EXTRACTOR—DOUBLE-STORIED HIVE—RUNNING AND ASSORTING HONEY,

COMB in the body of the hive is always liable to be visited by the queen and spoiled for table use by the deposition of eggs; and even if this be not the case, the close contact of nursery work, the continual tramp of the busy throng, and the deposit of pollen tends to render it less valuable, than that in supers, which to be perfect must be built quickly and filled with the nectar of flowers alone. It is wise not to super until the bees are ready to take possession; the hive must be full, and honey coming in. The cottager's straw cap placed over the feed hole in the crown of the skep, usually receives but little attention, but better results would be obtained if all openings between super and hive were closed by some luting to prevent the escape of heated air, and the whole covered well to save from chill at night and excessive heat by day (see page 8). Glass supers should have fixed from their roof, pieces of new drone comb, as bees cannot walk up their sides, and unless so assisted, build their wax works upwards, which is to them an unnatural, and, unfortunately for the careless, a slow process. The drone comb is thus attached: Warm the glass slowly and evenly, either before a fire or over a flame, and then gently rub the piece against the glass where it is to remain, taking care that it is right way up, *i.e.* that the cells slope upwards. The bees will quickly form a chain between our guide comb and the hive top, by linking themselves together, and upon this living ladder the laden wax workers will ascend to build and store. New drone comb may often be cut out from hives, where it is a damage, and utilized as indicated, saving time and honey. The reason for giving *drone* comb for store is already explained

at page 55. Our Scotch friends, however, prefer cells of worker size in exhibition supers. Besides the comb, the glass super is improved by a bottom board, the thinner the better, with a hole or holes in it answering to the openings in the hive. To this bottom board, let it be neatly fixed by gummed paper, and last but not least, give it a jacket consisting of cloth from an old coat or stuff from an old gown, used double with a layer of wadding between, or in lieu of wadding two or three thicknesses of brown paper. If this be neglected, the heated air rising from the hive with its charge of moisture, will be chilled as it touches the glass, which will be covered with dew, so that the bees cannot, if they would, fix their tracery.

Where the super is very small, and the arrangement of the combs not important, a piece or two of loose comb (an abomination to a bee), will often start operations in fixing it, which will be continued till the glass is removed, filled.

It is now the practice with most beekeepers to use bar or frame supers, which of course require guides to insure straight building; these can be added according to one of the plans already given for hives proper; but none as yet suggested equals the drone midribs extending to within about $\frac{1}{2}$ in. of the bottom of the super, except, indeed, the bars be completely furnished, and be given to the bees to fill merely—a course, manifestly, but very occasionally practicable. The gummed paper and the jacket with these bar supers are as desirable as with those wholly of glass. Comb cannot be built, because wax cannot be secreted, unless a high temperature is attained, and if by careless covering, this be lost at night, when naturally most comb is built, the loss to the beekeeper is apparent. It is desirable that the super should be shallow, as bees are loath to begin if the start must be made far from home. Place on a shallow super, let it be well in hand, and most of the comb getting towards the bottom, then separate if needs be, by slipping a thin wire under it; then place the new one between it and the hive. Mr. G. Fox of Kingsbridge, by carrying this principle to its ultimate limits, secured some of the largest harvests on record in this country. His supers were used over rectangular hives, and passed over them like a case. As the bees carried the combs down, the supers were gradually raised, stimulating the labourers in their efforts to lengthen the combs. It will be seen from this why we have previously said that the wooden bottom for the super should be thin. It should also be contrived so as to be taken away with the super, when, after clearing of bees, paper may be gummed over the openings, and all packed away without fear of damage from insect robbers. It is better that the entrance to the supers should not be through the centre, but at the sides of the hive as less likely to admit of the queen and pollen gatherers (see our crown board described page 20). Some admit their bees to the supers through perforated zinc, which lies over

the frames, the apertures of which measure 5-24ths of an inch—large enough to pass a loaded worker, but not the queen. The workers getting through are likely to fail in finding their way back, so Mr. Cowan, one of our most successful apiculturists, who works this plan, commonly places traps in his supers by which the bees continually pass out instead of returning through the hive.

The gentleman just referred to introduced, at the Crystal Palace show, in 1875, an admirable arrangement of boxes for receiving surplus honey. A number of these in tin, inverted side by side in close contact, make up the size of a large super, over which passes a good non-conducting cover. There is no greater loss of heat than if all were in one. Each box contains a piece of wax sheet, upon which the bees construct their comb. As completed, they are removed, and a lid put on, thus packing neatly and at once 3lb. or 4lb. of honey. These boxes, or similar ones in wood, to carry two combs, which some of the makers are now supplying, may be placed, in the American fashion, immediately over the hive frames without even the intervention of the perforated zinc, and are thus very readily accepted, as the heat of the colony passes freely

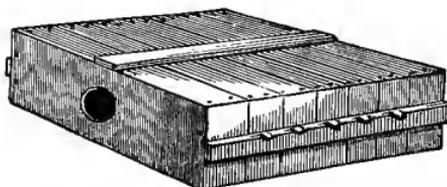


FIG. 43. NEIGHBOUR'S DIVISIONAL SUPER.

into them, while the access of the bees is perfectly open. The counterpoise to this advantage is the liability of brood being raised in them; but the risk is not serious, unless the hive itself is too small. In America it is common to use two tiers of boxes, worked like double supers. Mr. Neighbour's divisional supers (Fig. 43) give some of the advantages of independent boxes, while the chamber in which the bees work is really one. The side bar seen in the illustration being unscrewed the combs can be separately removed.

Store, upon which bees depend for "a rainy day," is placed over the brood nest. As a consequence, shallow hives, with a large area above yield the most super honey, but with these characteristics unduly developed they winter badly, and are very risky with the non-observant. A hive breeding heavily may fill a big super, the hope of the natural owners for dreary winter. But he who may by right divine appropriate, perhaps removes all, and, thinking his colony prosperous, leaves it to shift as it may. The honey harvest suddenly ceasing, the poor bees find themselves with the heavy demands of a big family occupying nearly every cell in the hive, suddenly deprived of all resource. Never think because a hive has given a large surplus it needs nothing; the most prosperous stock is the most likely to starve under such circumstances. Where there is much brood raising, the outgoing is tremendous, and food must be given liberally

till another glut of honey comes, or sufficient has been stored to last the winter.

Having taken a peep at our pets by raising the jacket, and having discovered that the lower cells of the outside combs are just being completed, with their air-tight snowy caps, we proceed thus, *i.e.*, if a bottom board has been supplied to the super, we simply slip the whole upon the hive top board, a distance equal to the diameter of the openings in it, and all communication between the hive and super is cut off. The bees quickly find they are imprisoned, and some begin to run about, while others lap up any bleeding honey. After leaving them a few minutes, they will be glad to fly in considerable numbers to the hive when their super is carried to a shady place. A few puffs of smoke given at intervals between which the super must be covered with a cloth to save it from robbers, will generally get rid of the remainder.

If the super be a large one, and many bees are found in it, or it is necessary to remove it before completion, it will be advisable to act somewhat differently. In the evening take off its jacket and wrap round it a wet cloth or towel, the evaporation from which will quickly cool the slabs of honey, and render the small spaces between them most uncomfortable quarters for their then owners. They will descend for the most part, and in the morning the operation may be much more easily performed by proceeding as before.

Or the supers may be placed in a box* immediately after removal, to one side of which has been attached one of Mr. Aston's bee traps, too well known to need description, taking care that the bees have exit from the super by its being blocked up beneath; but for this purpose, our little five-pin trap will be found to work quite as well as the one referred to, while it may be made in ten minutes with five pins. A hole $\frac{1}{2}$ in. in diameter, which may be made either square or round, is cut through a piece of thin wood. Four rather small pins are driven in, two above and two below the opening and on each side of a perpendicular line, which would pass across its centre and so near to each other that a fifth pin dropped between them will be held between the upper two by its head, while the lower two will prevent its being moved laterally. These pins are not driven straight into the wood, but slope upwards like an ordinary wall nail; three or four of these apertures should be made in a wooden slip, the section of which should be triangular (see Fig. 44), and which may then be fastened upon the opening in the super, all ingress closed, and light allowed to enter only by the holes in the bee trap; to this end, with the glass super, the box plan is the best. The bees coming to the light press upon the pin which crosses the hole; it immediately rises, and they freely make their exit, while entry is effectually barred. The hole to the right

* This box will be much more convenient if it open at the side

in our illustration is guarded by a pin held by a loop formed of another pin bent and driven into the wood. The extra trouble is here compensated by the greater durability of the trap. Bees cannot pass an opening less than 5-32 of an inch across, *i.e.*, what carpenters would call an eighth full, but this hole being one quarter divided and reduced by the thickness of the pin is an eighth bare. With our hive (arranged as explained at page 23), it is only necessary to cut off communication from below, either by running zinc slips over the slots in the crown board or simply sliding the super (if it carries a bottom) the width of the slot, removing its lid and shutting the super case, having fixed upon it the pin trap, when, in a few hours, every bee having given up possession, we appropriate "our share of the profits" without interruption.

If a super be taken off in the evening, it is often well to turn it up or remove its lid, and place some cover over it, which, while preventing any bees from entering, will give those within room for clustering. During the night, the cooling of the whole will force the bees to collect

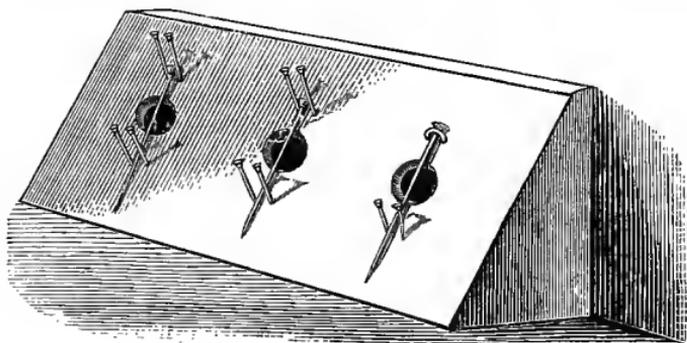


FIG. 44. CHESHIRE PIN TRAP.

in a mass in the cover, from which, in the morning, they may be returned to the hive. A good and simple plan for big boxes or straw caps is simply to invert them and place a thin cloth upon them, upon which the bees will collect as they travel to the light. Turning the cloth occasionally will soon rid the super of the last tenant.

If the bees refuse to leave in any case, the queen may be present, when the super must be replaced.

The extractor is invaluable in all large apiaries, as by its means honey can be secured without destroying the comb. Enough has already been said to show that wax is to the beekeeper a very costly product, but who does not see how important is the preservation of every particle of comb, when he considers that in addition to the wax, it absorbs in its construction a large amount of time, and greatly exhausts the energies, or, in other words, wears down the duration of the lives of the little

labourers. When we remove a super and break up its beautiful tracery in order to secure the honey, each pound of the wax, which may realise about 3s., is all that remains of 15lb. of honey at least, besides the labour demanded in giving it its matchless shape.

All the extractors hitherto brought before the public have depended for their action on centrifugal force. A typical form is seen in our illustration (Fig. 45). Within a zinc or tinfoil reservoir, which is commonly

supplied with a treacle tap at bottom for drawing off the honey, revolves a cage, not unlike an ordinary street lamp divested of its top, and upon the sides of which is tightly strained strong wire work. Through the centre of this cage passes a spindle so geared that it can be made to revolve rapidly. The usual cog-wheels may, in a home-made extractor, be replaced by a cord running round and fastened to the shaft. Pulling the cord, so as to unwind it, will revolve the whole apparatus, while *inertia* will re-wind and put the cord in condition for a fresh pull. The hive to be robbed is treated to a little smoke, and opened as usual; and as a precaution, which it is wise never to omit, search is made for the queen. During our hunt we become acquainted

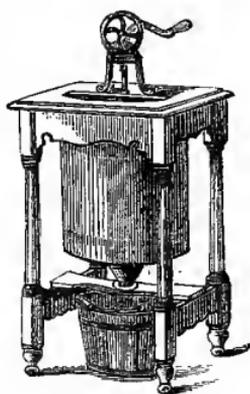


FIG. 45.
CENTRIFUGAL EXTRACTOR.

with the condition of things, and determine, according to date of year, object in view, &c., the number of combs from which we will extract honey. The outside comb is now removed, and the bees jerked or brushed from it, into the hive at once, or on to the board (see page 33 and Fig. 32) so often recommended, the latter will save the young bees that would otherwise drop on the ground, and will make the loss of the queen, even with a careless operator, almost impossible. The few remaining bees may be whisked off with a feather as we walk towards our extractor. The brood should be disturbed as little as possible, but the sealing from the honey cells, which encloses the nectar in an air-tight case, must be shaved off before the honey can escape, and for this purpose the correct tool is a double edged knife with a long narrow blade, bent up near the point, and almost like a trowel at the handle. Two of these are often employed; one gets into condition by standing in a narrow vessel of hot water, while the other is in the hand of the operator. The uncapping complete, the frame is dropped into position in the extractor, and the next taken from the hive to be treated as the first, and then placed opposite to its companion in the cage. This is necessary, for when rotation commences so violent is the strain caused by the effort of the comb to fly off at a tangent, that the whole apparatus without this balance would rock and sway in a most uncomfortable

manner. A few turns, and an examination will reveal all honey gone from one side. We reverse the frames, give a few turns more, and they, merely damp with a residue of honey, are ready to be returned for refilling.

A very useful extractor, or smielatore, as the Italians call it, for smaller apiaries, has been some time in use in Italy, and was sold at the Florence Exhibition of Apicultural Appliances for 6 francs, or about 5s. It can be so easily manufactured that we quote a description:*

“The upper part is simply a square tin box and cover (Fig. 46) into which the frame full of honey is placed, so as to rest upon the wire grating, which forms the bottom of the box, and can be removed to be cleaned. This grating is made of wire netting, of five wires to the inch,

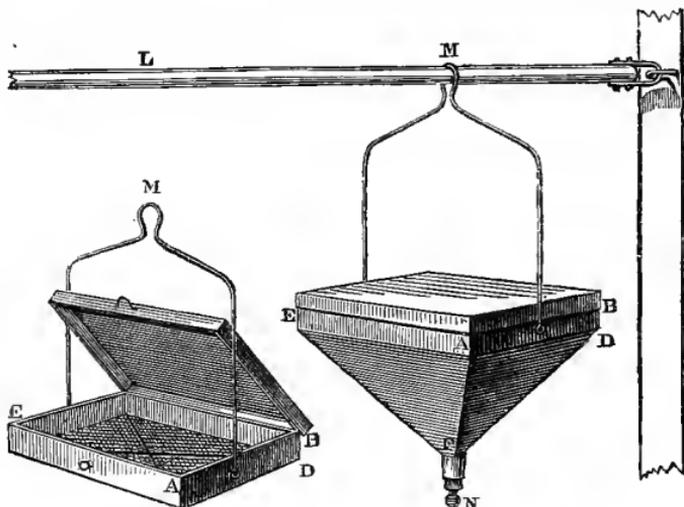


FIG. 46.
SMIELATORE COMB CHAMBER.

FIG. 47.
SMIELATORE HONEY BOX.

and is soldered round the edges to a frame of strong iron wire. On one side of this grating (the lower one when it is placed in the smielatore) it is strengthened by two diagonal stout iron wires which cross each other at the centre, the ends being soldered to opposite corners of the frame. The lower part of the smielatore is simply a funnel, shaped like an inverted pyramid (Fig. 47), at the apex of which there is a round tin tube (F), which is closed by a cork (N), when the smielatore is whirled round to extract the honey from the comb, and when that operation is finished the cork is pulled out, and the honey flows into any jar placed for it. If the purest honey is desired then on the inside of the funnel,

* “The Italian System of Beekeeping.” By Mr. Danyell; edited by Mr. Tegetmeier (*The Field office*).

at a short distance from the tube, a second and much finer grating may be soldered to the sides of the funnel. For this a piece of the finest wire netting, 4in. by 3in. is required; it is bound with a narrow border of tin, and soldered in its place. This finer grating will clear the honey of any particle of wax, pollen, &c. The handle of the smielatore is of thick iron wire, curved as shown in the figuree, and fixed to the two sides of the smielatore.

How to use the Smielatore.—Having taken a frame with honey in the comb (if the cells are full and have been sealed up by the bees it will be necessary to cut away the coverings so that the honey may flow freely), lay it on the upper compartment, shut the smielatore, and hang it by loop M on a stout stick, about 5ft. long. By moving the stick, swing the smielatore round a few times, then open it, turn the frame so as to take the honey on the other side of the comb, again swing the smielatore round the stick a few more times and then all the honey that was in the comb will be found in the funnel, and may be drawn off through the tap. Replace the empty comb in the hive and in a few days the bees will have refilled it. The same operation may be repeated again and again during the season."

But little practice will be required before the smielatore can be worked with comfort. Let the first attempt be made with the apparatus empty, two persons holding the pole, L M, which should be of ash, and not less than 1½in. in diameter, between them. A circular motion given to both ends of the pole will at once put the smielatore in rotation, and a trial or two will enable the experimenter to stop it as it comes to the upright position, which is necessary in practice, by first slackening the motion and then taking hold of the iron handle. The knack having been acquired, one end of the pole may have the iron loop, embracing a conveniently placed staple, fixed at its end with screws. A small groove at M, about 20in. from the iron loop, should be cut, but not so deeply as to endanger the breaking of the pole.

A few words must be devoted to those who would manufacture an extractor at home. It is most desirable to make the running gear light, and the can as small as possible; but as the centrifugal power for the same number of revolutions in a given time varies as the distance from the centre, the middle part of the comb must not, by contracting the cage, be brought too near to the spindle. And as the force acts radially it will be found that, if a wide comb be so placed the strain at the top and bottom of it will be as much upon the side of the cell as towards its opening so that more force must be used, with a liability of damaging the comb. The comb should always stand end downwards in an extractor, leaning somewhat outwards above, so that it will keep in place before the apparatus is started, and this position also assists in throwing out the honey as gravity acts along with the centrifugal power.

Where the honey season is short, but abundant, the harvest obtained by the extractor is immensely greater than that which supers can supply. Where the extractor is used the following plan works admirably: From a stock take out all the bees (see Artificial Swarming, p. 45), placing the swarm on the old stand, and putting the driven hive as a super over another strong stock. As the bees hatch out, the enormous working population, the progeny of two queens, will carry astounding weights of honey, which they will store in the upper hive. Using the extractor every four or five days will very generally prevent swarming, which will be still less likely if the queen be one of the current year. When the honey season flags the hives may be separated, dividing the brood between them, and giving a queen from a nucleus (see Chapter X.) to the queenless part.

The process of running honey, as usually performed, is rather a tedious one, but where there is an extractor or smielatore the housewife will be saved much labour, since super combs, as well as those from hives, can be better cleared by its means than by any other. Some gelatinous heather honey forms an exception. Failing the extractor, the combs must be assorted and all traces of brood cut out (which, by the way, if worker, should be promptly, after removal, placed over some hive held perpendicularly and at $\frac{1}{2}$ in. apart by little wooden uprights, and covered up warmly under a super, when it will be tended until hatched, strengthening the hive and rendering the work of obtaining wax from the comb the easier). Returning to our honey, the cells are sliced through and draining commenced in hair sieves, colanders, or on strained canvas. In three or four days, the operation being facilitated by a warm atmosphere, and the combs turned occasionally, most of the honey will be secured, but not without much waste.

By pressing the pure combs into a big jar, and raising all slowly to a temperature above that of melting wax, when it can be run through canvas and left to cool, the honey scarcely suffers at all in quality, less of it is lost, and much time is saved. The wax now removed, the honey is ready for filling into glasses, which should be securely tied over.

If *inferior* comb be treated in this manner, the dispersion of the pollen will render the honey turbid, but by placing the latter in a covered vessel in a quiet corner in the kitchen for a few months, the pollen will settle. The honey, now clear and bright, although probably of a dark colour, may be drawn off by a siphon until the sediment is reached, but care must be taken that the leg of the siphon does not dip deeply, or cloudiness will be the result. Give waste of all kinds (taking care that no robbing is induced) to the bees, who will clarify, filter, and store as they alone can.*

* Waste may be used in the making of vinegar, said to be of excellent quality, by washing with as little water as conveniently practicable, the broken combs after

If the honey is to be marketed, quality and colour are matters of importance, and by the use of the extractor specialities may be obtained. For example, if the white clover, which yields most beautifully transparent nectar, is beginning to be worked, from those combs we intend extracting we remove all the darker coloured and comparatively inferior honey which has been gathered from the fruit trees and earlier blooms. In these combs the clover honey will be stored without deterioration from admixture, and may be thrown out to the end of this important harvest in almost absolute purity.

Wax clarifying is best delayed until the bees are fully at rest, and all the odds and ends of comb of the year which can be put to no better use are gathered together for melting up. If it be done whilst bees are flying, the odour of the warm wax is to them so very enticing that the melting room will be most annoyingly besieged. It is economical to sort the collection into virgin comb (that in which breeding has not taken place) and brood comb. The first, being boiled with plenty of water, is poured through a gravy strainer into an earthenware vessel, which has first been slightly rubbed with soap to prevent adhesion of the wax. It is now cooled as slowly as possible. If really fine wax be desired, the vessel containing it will be wrapped up to retard solidification, to give time for any impurities to settle. The cake is then lifted from the water, the soiled parts beneath cut or scraped off, and the remainder remelted and poured into moulds. Such wax will be suitable for exhibition. The brood combs will be boiled similarly, and the whole poured through a strainer as before, and the chrysalis cases and debris removed from time to time, after squeezing with a ladle, in order to clear the strainer for a fresh charge. The *débris* still contains a good deal of wax, and may, as it has been pressed into a small space, be easily put into a coarse calico bag, with a piece of lead to sink it, and again boiled, a plate or fish strainer being put beneath to prevent burning. Kneading it about with the ladle during the boiling will cause most of the wax to rise to be skimmed off and added to the second quality wax before obtained, a final squeeze with a wet rolling pin on a wet board will leave little behind. The whole now obtained should be boiled with clean water poured into

they have been drained. The sieves, canvas, &c., which have entered into the process of draining, are also made to give up their sweets by rinsing. The honeyed water, which should contain not less than 2lb. to the gallon, is now exposed to the action of the air and the greatest heat of the sun; acetous fermentation takes place, and in about six weeks, vinegar is the result. Or waste honey may be converted into an alcoholic drink called metheglin, for the making of which Mr. Bagshaw gives the following recipe: Select combs, free from brood, that have had the honey drained from them; place the combs in a vessel and put as much lukewarm water upon them as will enable them to swim, let them stand two days and stir occasionally, strain the liquor and let it stand another day. Skim carefully and filter; when clear, boil an hour; the liquor will be sufficiently strong if an egg will float in it. To 3 gallons, add 1lb. raisins, 1oz. ginger, and seven or eight laurel leaves. When cool, add a little brewer's balm, and after standing a day, barrel it, but leave it open a few days to work; then cork it up, leaving it some months before bottling.

the soaped vessel and cooled slowly as before, and the settlings scraped or melted off by toasting before the fire, the impure droppings being caught in water and returned to the receptacle for scraps for subsequent clarifying.

Bleaching is performed by pouring wax on to water just cooler than that at which wax melts, it spreads itself out into thin plates, which are removed as fast as they set, when they are exposed for several days to the action of the sun on cloths or trays.

Honeydew is one of the nuisances of the beekeeper. When passing, whilst the sun is shining, beneath trees on the under sides of the leaves of which the aphid (green fly) is found, a shower of minute drops may generally be noticed. This is honeydew, which is produced from the bodies of the aphides, and may be seen on the upper sides of the leaves of the trees affected, as a sticky varnish. Its taste is unpleasant, although sweetish; but unfortunately bees appear to like it, for they gather it often in large quantities when true honey is not abundant. Its colour is exceedingly dark. We have seen aphid honey from sycamores as deep in tone as walnut liquor, and where much of it is stored the value of the whole crop is practically *nil*.

Propolis, found in every hive, has not as yet been turned by man to his account. It is a resinous substance obtained principally from the hybernacula or leaf buds of poplars, chesnuts, &c. The bees carry it as they do pollen, and with it not only varnish and strengthen their combs, but fill every objectionable crack and cranny; it much annoys the movable comb hivist, as the bees are always using it for fixing everything, but the application of a little tallow will reduce its hold as well as disincline the bees to insert it. We have seen a window cooling the interior uncomfortably coated over with a wall of this substance, and it is often to be noticed used in considerable amount in contracting hive entrances. If the fingers get soiled with it soap does not readily remove it; soda and hot water are required, but spirits of wine dissolves it at once—one application, a wipe with a cloth, and the fingers are clean. The more fastidious will find eau de Cologne produce the same satisfactory result immediately.

CHAPTER X.

ESTABLISHING AN APIARY, AND LIGURIANIZING.

SELECTING BEES FOR PURCHASE — CONDEMNED BEES — HIVE RANGES — TRANSFERRING — TRANSFERRING BOARD — STRAIGHTENING BARS — LIGURIANS — IMPORTED QUEENS — CHESHIRE DIVIDING FRAME — NUCLEUS HIVES — COLOURS FOR HIVES — QUEEN RAISING — PURE IMPREGNATION — LAMP NURSERIES — INSERTING QUEENS — CAGES — REGICIDAL KNOT — CARR CAGE — RAYNOE CAGE — FUMIGATION — HYBRIDIZING — DRONES, HOW PRODUCED — FERTILE WORKERS.

AN apiary may be started by the purchase of swarms or stocks. The latter, in skeps, being generally most economical. It is only exceptionally desirable to buy stocks in frame hives on account of the difficulty of transit and the higher cost. In selecting skeps choose those that have swarmed the year before, and that consequently possess a young queen, giving preference to those with large flat plates of comb (especially if it is intended to transfer to frame hives), and in which drone size is not over abundant. Casts of the year before will give the desirable conditions. In the autumn the bees ought to be strong in numbers, and in the early spring there should at least be four or five seams of them. At the close of the honey season, bees condemned by the cottagers to the sulphur pit, may be purchased very cheaply, about 1s. per hive; but where heath abounds, their owners do not take them up early enough to allow the method now given to be carried out satisfactorily. These being taken by drumming three or four skeps into one,* and then transferred into an empty hive, and fed well until they weigh 20lb. or 25lb., will usually make good stocks in the following spring, as they build no drone

* Where these bees are taken by fumigation, which we do not recommend, those from three or four hives should be poured into a box consisting largely of perforated zinc, when the free circulation of air will quickly restore them. Indeed, swarms stand long journeys in such boxes much better than in inverted skeps covered with canvas; but if they are used for making artificial swarms, the perforations must for the time be covered from the light, or the bees will not freely enter

comb. These condemned bees are of service also in strengthening stocks otherwise not populous enough to enter upon the winter. They must be added with the precautions given under the head "Uniting."

In planning an apiary, let it be remembered that it is by no means necessary that the hives should face the south or south-east, as some say; the well doing of the colony being apparently so little affected by this that authorities may be found pleading for the advantages of each point of the compass; and where hives are necessarily somewhat crowded placing the alighting boards in different directions considerably reduces the difficulties arising from excessive proximity. Thus, if four hives be placed in a close line running from east to west, and face in the sequence east, south, north, west, the young queens would not be at all endangered,

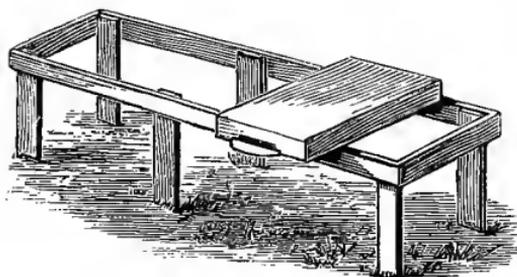


FIG. 48. HIVE RANGE.

stocks, such as seen at Fig. 48, may with convenience and economy be substituted for separate stands.

Skeps are commonly purchased with the idea of transferring their contents into frame hives, an operation not by any means difficult. Having cleared out the bees by "Drumming" (see Chapter VI.), we proceed to draw all sticks, if such exist, either seizing them by a pair of nippers at the projecting ends, and rotating them, to detach them from the combs, or, we may minimise the destruction of bee handwork by sacrificing the skep, simply cutting it in half while inverted, by passing through its sides, and between the combs, a sharp dinner knife. If we refuse to destroy the skep honey knives must be used. Of these there are two, one used to cut combs from the sides of the



FIG. 49. HONEY KNIFE.

(Fig. 49) consists of an iron or steel rod about 2ft. long and 5-16ths of an inch thick, having 2in. at its extremity turned to a right angle. The latter part is formed into a cutting blade, the surface of which is horizontal

from the cause pointed out already (see Bee Houses), and the bees would hardly be likely to get on terms too friendly—a common cause, unhappily, of a quarrel, both with bees and their masters.

With such a disposition of flight holes, hive ranges for three or four

hive, and which a piece of straight hoop iron from 14in. to 18in. long, and ground at the end may well replace; while the other

when the rod is held in a perpendicular position. The first knife having performed its work, the second is brought into play; having slipped it down by the side of the comb, it is turned so as to bring its blade into position for cutting the comb from the hive roof. This accomplished, carefully lift the comb and place it upon a board, greater in length and breadth than the frames which we are to transfer. This board will be less likely to damage the delicate edges of the cells or the covers of the pupæ if it has tacked upon it two or three thicknesses of woollen cloth. Place the frame over the comb, and with a sharp dinner knife mark the size of the former upon the latter, so that when trimmed it will fit as accurately as its size and shape will admit of, taking care that the top of the comb, as built in the old hive, shall also be the top as you fix it, for the cells are made to incline somewhat upwards. Keep the comb against one side of the frame, in order that a firm attachment may the more quickly be made; and fit in any good pieces of worker comb that may aid in filling out the frames. Thickened combs should be shaved down

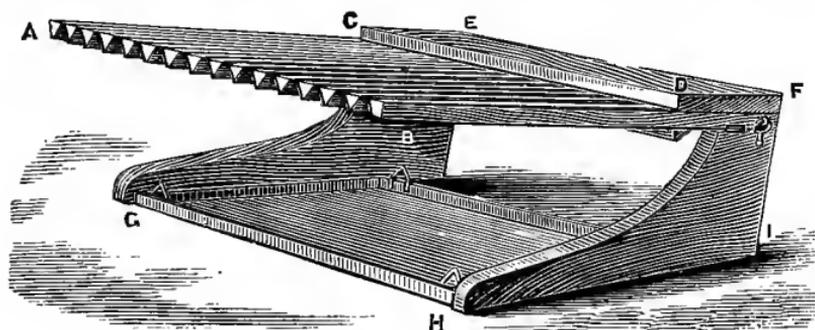


FIG. 50. CHESHIRE TRANSFERRING BOARD.

while drone cells should be wholly rejected, or placed only in the upper part of the outside frames. Should the comb not be deep enough to fit down to the bottom of the frame, it is necessary to put against its lower edge a strip of thin wood, about $\frac{3}{4}$ in. wide, when two or three tapes, that ought to have been laid on the board before putting the comb down, are passed around the frame and comb, or comb and lath, as the case may be, and securely tied. The board is now raised to the perpendicular, with the comb and frame upon it, when the latter is lifted by the ears and placed in the hive. Whilst treating the combs thus seriatim, it is highly important to keep the brood together, and if their previous relative positions be preserved better fitting will be secured.

Our prize transferring board, which we used while operating at the Crystal Palace, will be found to much facilitate the process. The operator places the apparatus upon a table standing opposite its face A, B, (Fig. 50).

The comb is now put upon the sixteen rods, made somewhat like the teeth of a hair comb, with its top towards the operator.. The marking and trimming is managed as before described, while the zinc tray G, H, catches the bleeding honey, which falls immediately through, or runs down

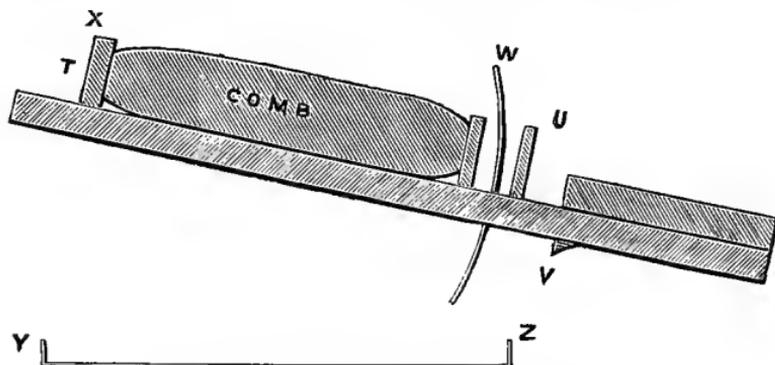


FIG. 51. TRANSFERRING BOARD (SECTION.)

to the dropping edge seen in the cross section V, (Fig. 51), while the edge of the tray (Y, Z) allows the knife to be conveniently cleaned by scraping. Tape, W, or lead wire (we prefer the former) is now passed through between the teeth and beneath the lath; or, if the comb extend to the bottom of the frame, beneath the bottom rail (U), and tied at X, at the angle of the top bar T.

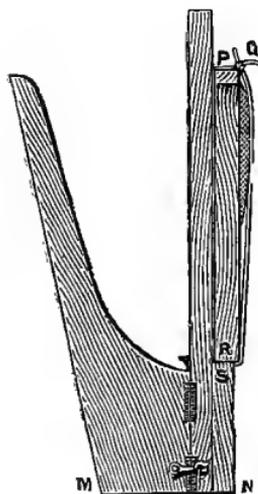


FIG. 52.

A firmer knot can be more easily made here (as in Fig. 52) than at any other point. The frame is now pushed from the operator until its bottom rail touches C, D (Fig. 50), or S (Fig. 52), when the apparatus is raised in front until it stands on its back, M, N (Fig. 52). When the comb and frame rest in the perpendicular position, as seen at P, R (Fig. 52), it is lifted by its ears and placed in the hive.

When the transferring board is out of use, the hook at F (Fig. 50) is unfastened, when the feet fold back, and the four wire eyes of the tray, three of which are seen at G, B, and H (Fig. 50), slide over two of the teeth, keeping it in position, while within the tray can be placed the

brush, tapes, knife, and other requisites—no small convenience when the transferring has to be done at a distance from home. The thickness when closed is $1\frac{1}{2}$ in.

If the combs are much waded, it may be desirable to place a slat of

thin wood $\frac{1}{2}$ inch longer than the frame on each side of it, and pass a small india-rubber ring over the projecting ends; this will straighten the comb until the bees have made it secure. Where much transferring is done, these slats may be kept fastened together in pairs, by a string the same length as the width of the frame. When these are clapped over the comb, fastening the free ends will be the work of a few seconds. It will be impossible to prevent the destruction of some larvæ, but the beginner need not grow faint hearted. Repairs will be executed in a wondrous manner, while the mortally wounded, and the killed, will be quickly removed, their juices helping to sustain the labourers in their arduous duties. The motto, "waste not, want not," seeming to be more universally acknowledged by bees than by men.

The work so far completed, the bees must be introduced according to the plans already given (see page 32). The honey set running during the operation will be gathered up, and will supply immediate needs; but great demands will be made for wax secretion, to fill gaps and make attachments, so that it is usually good economy to feed slowly for a day or two, but of course circumstance liable to much variation must be our guide.

In forty-eight hours an examination may be made, when if the combs appear firmly fixed, the tapes may be removed; but excessive haste is the precursor of disaster, as one comb falling, will, like a tumbling skittle, knock down most of the others. Let the beginner, who has concluded that artificial supports are no longer necessary, draw a sharp knife across the tape, severing it upon the top rail of the frame, as it occupies its usual position; it may then be gently raised, carefully preserving the perpendicular. The tapes, by a touch, can now be detached from each side, without giving the jar to the tender work so likely to lead to discomfiture if the whole operation is carried out by a novice when the frame is out of the hive. If the tapes be not removed, the bees will tease and fret them until they dislodge them literally fibre by fibre. Several years since, we had fastened in a comb by a string, and quite forgotten the circumstance, until apparently, a piece of extremely thick chenille was observed waving in a singular manner at the hive door. The chenille as we approached, resolved itself into a dense chain of bees most earnestly flying, while holding on to the string, which they had torn almost to shuff, had separated from their comb, and were endeavouring to eject altogether from their domain, success being only delayed by the string locking itself between the hive and the bottom board.

During the honey harvest, transferring may be performed in the open, but generally, a building is necessary to avoid the annoyance of robbers. Chilly weather is unfit, because the brood is likely to suffer while repair is carried on tardily. Very hot weather makes the combs so soft, that they sink out of form, the lower cells being flattened by the weight of

those above them. The recommendation to transfer three weeks after swarming has its advantages, but is not without its dangers. The brood will all have hatched out, but the combs will generally be heavy with honey, so that they will be not a whit more easy to handle; and if the queen has not obtained fertilization—quite a possibility at this date—we may take up the skep at the moment of her absence, and cause her loss. Four or five days after transferring, it is desirable to clean the bottom board, as a considerable amount of *débris* is thrown down in the process of repairing and refitting.

The *Ligurian*, or more properly the Alp bee, with its beautiful yellow bands, strong whitish pubescent rings, and gracefully modelled abdomen has not wanted for champions who have again and again asserted its vast superiority over our more sombre hued variety; nor has the latter been left altogether without defenders, who may, we think, fairly claim that black bees properly handled, in this country at least, achieve results certainly not far behind those placed to the credit of its rival. A lengthened observation of the two is evidently needed before a conclusion of any value can be arrived at. We are of opinion that the *Ligurian* (*Apis ligustica*) is much more prolific than the black (*Apis mellifica*), and that it is ready for swarming earlier, advantages of no mean weight; but we have failed to note that greater strength of constitution in the foreigner which some assert. We also think the preference given to imported queens a mistake on more grounds than one. Sometimes, undoubtedly, the Italian dealers raise these mothers in very small hives, with but few bees, and as a result the queens are weak and fade early; we have seen such scarcely larger than workers. The transit occupying many days generally reduces the "royal prisoners" to a very poor condition, and this necessarily for a time, probably permanently, injures the constitution. *Imported queens, although often of fine quality, are, for the reasons given, not, on an average, equal, from the utilitarian point of view, to those Ligurians raised at home,* which ought to be always the progeny of the best stocks in the apiary (see "Artificial Swarming"), while they are bred in the midst of a strong population, from eggs laid by a mother very actively ovipositing, and have no subsequent check. If pure impregnation be obtained, or a misalliance occur, the bees resulting are always excellent as honey gatherers; in the latter case they are even better than in the former, although aesthetically and in temper much inferior.

The black bee hardly now exists, everywhere he has been improved by foreign blood. In 1874 in a most isolated moorland in Northumberland, where frame hives were unknown, but where little skeps abound, we failed to find a pure specimen of the English variety.

Previous chapters have already shown the advantage of having at command fertile queens. To facilitate the operation of raising these we introduced our dividing frame by means of which small hives with little

lots of bees (technically *nuclei*) can be readily formed, and having done duty returned to any stock without loss. We will explain the method of making the frame, giving the measurements for the Woodbury, but these can, of course, be most easily altered to any standard.

A strip of wood (Fig. 53) $\frac{3}{8}$ in. thick and $\frac{3}{8}$ in. wide is cut 16 $\frac{1}{2}$ in. long,



FIG. 53.

and pencil lines *b* and *h* are drawn across it $\frac{3}{8}$ in. from its extremities, the line *e* occupies the centre, exactly 8 $\frac{1}{2}$ in. from each end, and *c*, *d*, *e*, *f*, and *g*, are placed at $\frac{3}{8}$ in. from each other, *k l* and *m n* are now added with a gauge marker, and *e* being cut through with a fine saw, the parts shaded are removed. The tongue thus left on one half fits into the hollow made in the other, so that the two being chut together the length of the bar is reduced to 15in. and fits the Woodbury hive. To the respective halves, with brads or panel pins, the uprights of the frames, each 8in. long, are fixed, having their outer faces upon the lines *b* and *d*, *f* and *h*. The bottom bars complete the whole, which takes the form of Fig. 54. Holes

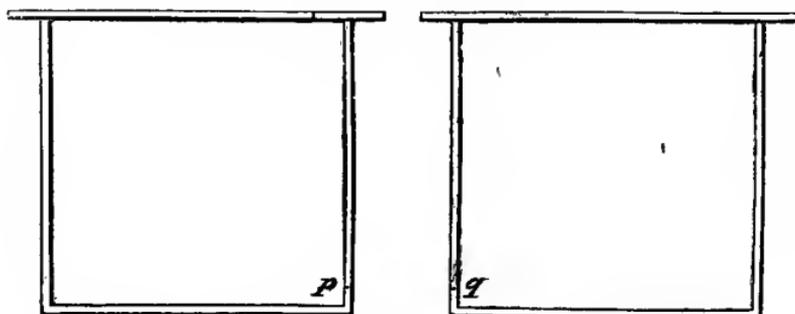


FIG. 54. CHESHIRE TWIN FRAME.

bored at *p* and *q*, receiving a bellhanger's clip when the halves have been put together, make the frame fit to receive the comb, which should contain hatching brood, and may be transferred from an ordinary frame with scarcely any loss. It may then be placed in the hive whence the comb was taken, for the bees to fix and repair the latter. In twenty-four hours it will be ready for removal to the nucleus hive, which for these frames should be 3 $\frac{3}{4}$ in. wide inside, 9in. deep, and 7 $\frac{1}{2}$ from front to rear. We make ours with double sides, with air space, this is desirable, as bees thus protected, even when in small numbers, maintain their necessary heat; while in their makeshift nucleus boxes they are chilled at night and scorched by day, and often raise poor and weak queens from the cells

supplied to them. A water tight roof is necessary, nor must arrangements for feeding be forgotten, as small nuclei scarcely ever gather food enough to maintain themselves. The nucleus hive, and indeed every hive, if painted, should be of light colour, because light colours radiate heat less freely than dark ones, they are therefore warmer in cold weather. Nature is true to her laws in bleaching the coats of the Polar bear and Arctic fox. Light colours, also, are cooler in the direct rays of the sun, because they do not absorb heat. For quite similar reasons every hive should be smooth on the outside, mere bee comfort considered, altogether apart from the question of appearance and durability. To stock the nucleus, remove the dividing frame—be sure the queen is not upon it—and separate the parts, disturbing the adherent bees as little as possible, place the halves side by side in position, and cover warmly. The older bees will return to the parent stock, so that a frame containing young bees should be shaken on to a board in front of the nucleus*—these will make up the population, the strength of which will be maintained by new bees hatching out. A queen cell may now be inserted, as before described (see p. 43), taking care to keep it as much between the combs as possible, and the queen utilised when she becomes fertile, or she may be kept until “proved,” *i.e.*, her qualities declared by her young bees hatching. Nuclei are often used to secure the pure mating of Ligurian mothers, which can never be calculated upon if they are allowed to fly at will, howsoever numerous our yellow banded drones may be, if black suitors are at all found in the locality. A great assistance in this matter is to stimulate a Ligurian stock very early in the year, by feeding, and even also by the addition of bees, or cards of brood, so that the coveted drones may be raised in a comb of the larger cells purposely placed in the centre of the brood nest, before the time that any sable rascals are called into existence. The nymphs being raised immediately after we think fit to remove the queen; the course is clear, and is only likely to be frustrated by weather so chilly that the gentlemen “to-pleasure born” refuse to leave the snug hive, although the queen will fly again and again until her marriageable age (about three weeks) is passed, when she will commence to lay a comparatively small number of eggs which will produce drones only. The order may be reversed, and queens raised so late in the year (latter part of September) that normally all drones will have been destroyed. The yellow banded ones upon which we are depending being reserved by keeping their colony queenless, such allowing the males to live, and even giving asylum to those of other hives, but failure is not infrequent, and then the year is gone, making recovery impossible. With nuclei success is all but certain if we act as follows: Having chosen our drone-raising and queen-raising

* In this way at any time the population may be strengthened as occasion requires.

stocks (it is better that these should not be one and the same), the nuclei receiving cells from the latter are placed near the former; on the evening of the sixth day after the hatching of each queen (queens generally fly when seven days old, see page 6) the nucleus containing her is placed in a dark cupboard or cellar after the flight hole has been closed by perforated zinc. The next afternoon being so far advanced that drones are for the most part quietly resting from their midday wanderings, the drone-containing hive is opened and thoroughly warm diluted honey sprinkled over bees and frames. The nucleus is now brought from its hiding place and placed so that the sun shines fully into the flight hole, while it is also treated to a libation of warm bee nectar. The queen will in all probability soon issue, to be joined by one of the drones, which will in large numbers be now careering around the excited stock. If the drones seem idle jerk some of them from a frame into the air. Should the queen fail to come forth the operation may be repeated the following day. When the nuclei are no longer required their frames may be placed in one hive, which one of the hatched queens may head.

The Americans have lately been hatching royal cells in little chambers warmed by a lamp. Queens from these "lamp nurseries" if simply dropped in amongst the bees of a colony needing them are almost always received at once. For the exceptions as yet no satisfactory reason has been assigned.

Bees upon losing their queens are in a few hours thrown into the greatest possible excitement, searching wildly both inside and outside the hive for the lost sovereign, when occasionally they will gladly accept an alien; but in the majority of instances the aspirant for the vacant throne is either killed at once or surrounded ("encased") by a dense mass of closely clinging bees, whose grip is often unrelaxed until the poor worried insect dies after three or four days of imprisonment. Sometimes, however, the encasement gradually slackens and at last breaks up. Strangers may be introduced by means of cages, which admit of an acquaintance being formed while the queen is safe from attack; after a day or two of confinement the workers attend her, as soon as released, with every appearance of attachment. The most simple form of cage, the one we almost always use, is seen of the true size at Fig. 55, and consists of a ring of tin plate on to which is soldered a dome of wire cloth, with meshes about a tenth square. The queen whom we desire to instal, being an

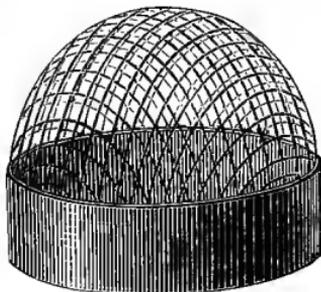


FIG. 55. QUEEN'S CAGE.

imported one, the box containing her should be opened under cover, as she is likely to fly. This trouble arising in the open air, a little patience will commonly be rewarded by seeing her return to the comb whence she took wing. Place her upon a piece of card hardly wider than the cage, which is carefully popped over her. Select a tough brood comb, and upon a part of it containing some unsealed honey, after having driven the bees from the spot by smoke, place card and cage; slip away the card with caution, for a tiny leg is soon broken, and then with a screwing motion cut the tin rim into the comb down to the midrib, as in Fig. 56. With skeps the cage may be placed in the bung hole and the bees kept about it by the food bottle. We always feed whilst a queen is caged in a frame

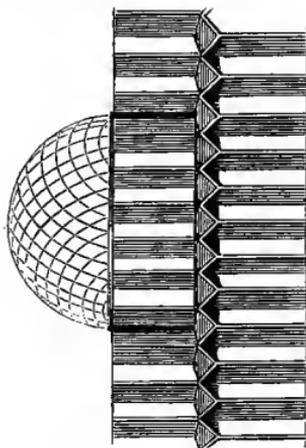


FIG. 56. QUEEN CAGE FIXED.

hive, and believe that it facilitates the introduction, since we rarely find any risk in giving the prisoner liberty in twenty-four hours. The usual practice, however, is to continue the confinement three days. When the cage is lifted, if the would-be mother-in-law is touched constantly with antennæ, whilst the way is cleared for her as she advances, all is well, but if the throng rudely crowd about her, and clamour upon her wings an encasement is to be feared, when she had better be returned to the cage for another day. The encasement of a queen is always attended with a good deal of noise and uproar, distinctly heard at the hive door. The beekeeper may conclude that "all's well"

if quietude reigns after a queen is liberated, but when circumstances are suspicious the hive should be opened and the regicidal knot broken up, either picking the bees one by one from the mass or dipping the whole into warm water, when the queen escapes with a ducking. Some beekeepers assert, and no doubt with truth, that the disturbance occasioned by opening the hive to release the queen diminishes her chance of a favourable reception, and have, in order to make the opening of the hive unnecessary, invented forms about which a word or two must be given. We, however, much prefer to watch the action of the bees, and have more than once saved the life of a valuable queen, which certainly never would have been received from circumstances existing in the hive of which we were ignorant. The well known Mr. W. Carr, first in the field, gave us, many years since, a cage larger in area than the one already figured, but which is in a similar manner pressed into the comb while a wire drawn out through the feeding hole admits of the pulling of a slide which allowed the queen to pass into the midst of

those bees that had before been paying court to her through the prison bars. Many prominent apiculturists are fully of opinion that the intense animosity often shown by bees to a stranger queen will not in any case prevent them feeding her if she be caged amongst them. If this opinion be correct, the access to the food which the cages previously mentioned give, is unnecessary. The talented "Renfrewshire Beekeeper" has accordingly introduced an admirable little cage, which, as somewhat modified by the Rev. G. Raynor, appears in our illustration (Fig. 57). Its body fits the unvarying width between the combs, while the plate above, dropping on to the frames or feed hole, prevents it from slipping into the hive, the wire connected with the lower door giving liberty to the prisoner when it is depressed. The Rev. G. Raynor thus describes his use of this cage in the *British Bee Journal*: "My hybrid stocks being in bar frame hives, the queen was taken from each stock, the hive closed, the cage inserted through the centre hole, and the old queen placed in the cage through the upper door, where she remained about six hours. She was then liberated, and the Ligurian queen, by means of the upper door, without any disturbance of bees or cage, took her place. After an imprisonment of twenty-four hours, the new queen was introduced to her new subjects by means of the lower door, again without the least disturbance—in most cases *after dark*. On the following day each insertion was verified; and the thrill of pleasure on beholding twelve new monarchs in succession safely enthroned perambulating the brood combs of large and populous bar frame hives, such monarchs, too, for size and colour! will be better realised by old beekeepers than described by me." These honeyless cages have not always succeeded, however. The queen in them, so far as appearances can be trusted, occasionally being allowed to starve; but the failures have mostly been noted as occurring where breeding has been long suspended, and consequently where *young bees*, whose natural duty is that of feeding, are not found. Although queens can be most easily established at the heads of colonies where young bees are abundant, the presence of eggs and freshly hatched grubs from which princesses may be evolved, must always be regarded as an impediment; and if royal cells have been commenced before the queen, for whom a throne is sought, is caged in the hive, they should be carefully destroyed. In the height of the honey season the older workers are so busily occupied in filling the store combs, whilst the juveniles of the brood nest are so unsuspectingly ready to act as "maids in waiting" to any royal lady, that the rightful sovereign may be quickly picked up

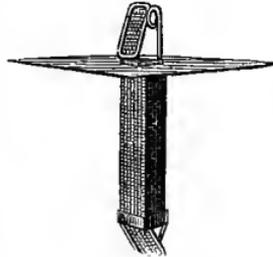


FIG. 57.
RAYNOR QUEEN CAGE.

and a usurper at once put into her place, with but little chance of her being challenged, while still more commonly a queen would be accepted by orphan bees if she be simply well smeared with honey taken from the hive to which she is presented. But experiments such as these only the expert should try.

Fumigation is occasionally resorted to for introducing queens. Puff ball, well dried, is lighted and placed in some such apparatus as Fig. 58, and by means of the breath or a pair of bellows a stream of air is driven through the burning puff into the hive mouth. If operating upon a skep a second one inverted should be placed under it to receive the bees, which soon become comatose and fall from their combs, a gentle pat or two shaking them down. The queen is now looked for and removed, when the stranger, with her body guard, is placed in possession of the combs, where she will soon be joined by her then unconscious daughters-in-law. Apiarians are generally of opinion that fumigation is prejudicial, while it certainly is but rarely necessary. Where bees persist in refusing a queen it may become inevitable. We have also used it in changing the queens of swarms of a few weeks old, whose combs have been too tender to admit of drumming.

So-called systems of Ligurianizing are legion, but in almost every case



FIG. 58. FUMIGATOR.

they can only be recommended to the tyro, since they produce hybrids instead of pure bees. Here is an example. Having one Ligurian stock to *Ligurianize* by it a number of black ones. Drive the Ligurians and one of the black stocks. Reverse the stands of the driven hives, and return the bees at their old stations, destroying the black queen before doing so. The black bees will raise a new queen from the Ligurian eggs. Repeat the process at intervals of a week with the stock then containing the *Ligurian queen* and the other black stocks in order. The temporary occupation of the Ligurian queen gives time for all the black eggs to hatch and get past the stage in which they can be converted into princesses, Ligurian eggs at the same time being deposited; but since while queens are flying it is impossible to keep trapping drones from the colonies containing them, hybridisation would occur nineteen times out of twenty, while the new queen is obtained at the cost of twenty-five days' egg laying, a period much reduced by the plans elsewhere given in these pages.

It has been previously stated that if a queen continue to fail to meet a partner when she again and again flies to secure the responsibilities of

maternity, she at length deposits eggs producing drones only. The vitalizing fluid retained in the spermatheca of the impregnated mother causing the eggs brought in contact with it to produce workers, while those eggs not so affected yield males only. That is, drones are hatched from unimpregnated eggs. Hence a black queen mated with a Ligurian will produce crossed workers and black drones, and *vice versa*, but it is by no means settled that the drones of unimpregnated queens are equally virile with those of the impregnated. This interesting question must not, however, draw us from our intention of adhering to the "practical" only in these pages, our object in introducing it being to say something of *fertile workers*, *i.e.*, worker bees (all of which are known to be undeveloped females), capable of laying eggs. Sometimes, soon after the loss of a queen, less frequently at other times, evidences will be found of the presence of one of these pests, the cells will either contain three, four, or more eggs each, or will have been considerably elongated to give room for the excessive size of the grubs—drones, although in worker cells. The fertile worker cannot be distinguished from the rest. She is destroying the hive, and queens stand very little chance of safe introduction while she lives. The bees, in despair, often construct queen cells around her eggs, which of course yield dead drones only. The giving of a normal queen cell will now and again succeed; but after all the worker brood the hive contains has been some days hatched out we may try this plan of losing the pseudo-mother: Take all the frames and adherent bees from the hive to a distance of twenty or thirty yards, and then jerk the bees into the air; they will return to their known stand, but the fertile worker, not having flown, will probably be lost. The combs will be replaced, and if eggs cease to appear in them a new queen may be given, but the colony is usually by this time only worth uniting to another.

Our friend, Mr. J. Hunter, has had quite recently the good fortune to obtain, through Mr. Obed Poole, a *worker* caught in the act of ovipositing. Upon dissection, one of the ovaries was found to be rudimentary, but the other was partially developed. Five of its ovarian tubes (egg tubes) contained about twenty eggs each. At last, then, anatomical demonstration of the existence of fertile workers has been obtained.



CHAPTER XI.

DISEASES AND ENEMIES.

FOUL BROOD — SIGNS OF — CAUSE OF — CURE — ERADICATION —
 OHILLED BROOD — DYSENTERY — ENEMIES — WAX MOTH — PRE-
 SERVING COMBS — BRAULA CÆCA — WASPS — TOADS — SNAILS AND
 MICE — THE TOMTIT — FOWLS.

BEES are subject to a disease at once terribly contagious and fatal, called foul brood. It effects the larvæ, the adults suffering only on account of the tainting of the atmosphere of the hive, by the putrescent exhalations from the dead bodies of the grubs. Many amongst the brood, if the outbreak be malignant, may be seen of an unhealthy yellowish tone, instead of pearly white. Some of these die before sealing, and since their remains appear too nauseous for the bees to remove, they rot and dry at the lower side of the cell, until a shrivelled brownish scale alone remains. The caps covering the cells of those dead since sealing, are sunken rather than raised, and pierced by one or two holes of various sizes. The sealing appears to be thinner than that over healthy grubs. If the cover be taken off, a semi-fluid viscid mass is found, which may be drawn into strings like half dry glue, while it emits the same sickening odour which fills with minor intensity the whole hive.* By the signs here given, this fell pest may be known; but the inexperienced must not mistake a cell, the sealing of which is unfinished, or a honey cell opened that its contents may be consumed, for a punctured foul-broody one.

An account of some interesting experiments by Dr. Schönfeld, conclusively showing the cause of the disease, and translated by an enthusiastic apiculturist, Mr. J. S. Wood, for the *British Bee Journal* requires some notice, as the facts arrived at, point to the means to be adopted for arresting the disease. It had before been known that foul-brood was in some way connected with the presence of micrococcus (an extremely

* This substance diluted with water, and placed under a thin cover, will show with a good microscope, an eighth objective, innumerable micrococcus germs.

minute fungus), but whether as a cause or result was not determined. If a cause, how were the spores transmitted from hive to hive? Dr. Schönfeld thus describes his experiment intended to set this matter at rest: "On a smooth-planed board I placed a bell glass, in the top of which was a round hole, in this I fixed a glass tube two feet long, there was also fixed a similar glass tube in the board. In the top of the uppermost tube, was forced a plug of cotton wool, as also in the under end of the bottom tube; and the wool was not pressed tight, but so that the air could circulate freely through both tubes. The foul brood substance that I had received from Herr Locher, was now placed under the bell glass on the 21st of June, and left to dry slowly. If then, the assertion that the spores escaped in the air when the substance was dry was correct, it was only necessary for me now and then to place the apparatus by the window in my study, and expose it to the full influence of the sunbeams, as, if the air in the bell glass, by the power of the sunbeams, was warmed up to 40°, it must, by a well known physical law, escape through the uppermost tube, while the cooler air from the floor of the study must enter the bell glass through the bottom tube, and at the same time it was quite as certain that therewithal the spores of the fungus that were carried by the upward current of air, would be caught in the wool above."

Our limits will not allow us to follow the doctor *in extenso*. Suffice it to say that the microscope revealed abundance of *Fungus micrococcus* in the top cotton plug, proving that the spores escape into the atmosphere from dry, foul-broody matter; and since bees ventilate their hives strongly, it became apparent that multitudes of spores must leave in the out-blast of an infected hive. It now remained but to show that the collected micrococcus spores were capable of diseasing and killing healthy larvæ. In healthy stocks larvæ, to which any portion of this cotton saturated with spores was applied, became foul-broody, and were found to contain the *Fungus micrococci* in immense numbers. To make the case more conclusive, blowfly larvæ, whose changes are analogous to those of the bee (see page 5), were touched with the cotton, and all died diseased similarly to foul-broody grubs, micrococci in multitudes being found within them. We thus gather that it is the dried matter which carries danger, and not the wet putrescent bodies. If a remedy is to be found it must be capable of preventing the fungus growth. Salicylic acid seems such a substance, having the power of preventing mildew, which is itself a minute fungus. Salicylic acid is neither poisonous nor corrosive, and may in solution (twenty-five grains to eight ounces water), be distributed over combs, and even bees also, without any damaging effect. Any portion of comb in which the disease has shown itself should be cut out and the combs throughout disinfected with a spray producer, taking care that every cell receives some of the

fine shower. The bottom of the hive should be well cleaned, and the salicylic acid solution applied. By great watchfulness and cleanliness the malady may be eradicated, but it is usually wise, *always* so in severe cases, to remove the queen, either with a swarm or not, according to the strength of the hive (the queen does not carry the infection), so as to give the disease less hold by reducing the brood. About nine or ten days after inserting a ripe queen cell, so that by the time the queen resulting commences to lay, all the living brood will have hatched out. A forced swarm should now be made of the whole of them, their combs destroyed, and the hive disinfected. Let the bees work in a box or skep twenty-four hours, then turn them into a perfectly clean hive *without* combs, and begin to feed, boiling with the food salicylic acid. No combs are to be given, in order that the foul-broody honey the bees have taken with them, may not be stored, as some of it would otherwise be, but all consumed in evolving wax.

In early spring, bees are occasionally forced so near to each other for mutual warmth when the thermometer takes one of its dips, that the outside brood is neglected, gets chilled, and dies in consequence. Such brood assumes an appearance resembling rather closely foul-brood, but differs from it in not being contagious—it is called chilled-brood.

Dysentery, during an attack of which the bees, usually so cleanly, discharge themselves upon their combs, and die with distended abdomens, sometimes even bursting, may be brought on by wintering bees upon watery food given too late in the year to admit of its proper evaporation and sealing, or by making their homes damp by lack of protection or ventilation, or by long confinement with excitement. The remedy consists in removing the cause. Remove the bees if possible, to a clean hive—at least, cleanse and dry the floor board, and exchange any combs containing unsealed honey for others. Give barley sugar as food. Ventilate the hive well; protect as thoroughly as possible from cold, and subject the patients to no avoidable disturbance.

The British wax moth *Achroia grisella*, is but little to be feared. The moth *Galleria mellonella*, common in Italy, and sometimes found in the combs accompanying imported queens, is both much larger, and more destructive; its bad reputation seems to have been by mistake attached to our own species, which is consequently dreaded much more than its small power for mischief justifies. Late in the summer evening, this moth may occasionally be seen flitting at the hive door to gain access to the combs on which to lay her eggs; but if the population be at all numerous, the guards give her but small chance of effecting an entrance; should she succeed, the eggs deposited on the combs will be at once ejected, unless the bees are so sparse as to leave them unvisited. Eggs may possibly hatch if deposited in unreachable corners, or in the debris, collecting from wax plates dropped during comb building, and sealing,

always falling, where much brood is coming out; but here the little grubs only gain an existence by gathering up the fragments, that nothing be lost, according to a deeply impressed law of nature; and only where a colony is miserably weak, or has lost heart through hopeless queenlessness, can they work mischief amongst the combs. Gaining these, they construct as they worm their way through the midrib, a silky tunnel, on the walls of which will be found their *dejectamenta*, resembling grains of gunpowder, and by degrees the comb is utterly ruined. Although, therefore, stocks in England are not likely to suffer from wax moths, combs in store may be destroyed from their ravages. The tiny egg is but the 100th of an inch in diameter, and so likely to escape detection. Should the characteristic flannelly line, holding in its texture minute whitish particles, shew itself near the bases of the cells, expose the whole to the fumes of burning sulphur. The sulphurous acid produced, quickly gives the quietus to the little tormentors. No further attention will be necessary if we place the combs out of the reach of the moth.

The *Braula cæca*, a small reddish brown louse, about the size of the head of a pin, is a most singularly formed creature, and no bee keeper possessing a microscope should fail, upon discovering one, to make an examination of it. Its foot is unique. The insects are found on the Continent in immense numbers in some stocks, almost every bee carrying many of them. On imported queens they are not uncommon, and may be propagated here, as in 1874 we had many hundreds in one colony, but by the spring they had disappeared.

Wasps often annoy the bees considerably; but it is only with weak stocks (and weak stocks ought only as an exception to be found in a beemaster's apiary) that they can do mischief. Here they often succeed in entering in such numbers as to much impoverish the hive. Destroy all queen wasps in the spring, as each of these, known by their larger abdomen, start an independent colony; and treat all nests to turpentine or cyanide of potassium.

Toads we have known to fatten amazingly, while the lightning tongue has caused hundreds of over fatigued labourers to disappear, as they have fallen exhausted, at the very door of home, into a tangle of weeds, which afford too good a covert for the enemy. If spent tan be spread around the hives, weeds will be banished and the unwelcome bee fancier also.

Snails and *mice* must be kept out, by making the entrance during cold weather too narrow to admit them. In the warmer part of the year the bees themselves make this precaution unnecessary. If mice enter they bite away the attachments of the comb to get at the honey. The combs fall, and often ruin the whole hive.

The blue tit (*Parus cæruleus*) and the great tit (*Parus major*), during prolonged cold, are often reduced to extremities, and then they are too ready to make a meal of such members of our stock as they may chance

to pick up by waiting at the hive door. Our friend Mr. Hunter related to us that he had found on a fence rail hundreds of the stings of bees, which had apparently been extracted by these birds before regaling on their bodies. A wire screen like a fire guard, will secure our bees from their bills.

Fowls wandering in an apiary tend to weaken the hives during the summer, as they will coolly pick up from the alighting-board the workers as they issue if the former be at a height they can reach. In any case many bees resting on the ground fall a sacrifice to their restless bills; but since, as a rule, it is only the over-wearied labourers missing their mark as they are about to enter the flight-hole that are found on the ground at all, and then always quite close to their hive, keeping the fowls a yard or two from the entrance will reduce their power of working mischief to limits not worth consideration.



CHAPTER XII.



WINTERING.

AMOUNT OF STORE REQUIRED—BARLEY SUGAR FEEDING—HAY-
RICK COVER—VENTILATION—HONEY A SOURCE OF HEAT—
WHY WEAK STOCKS WINTER BADLY—AIR OF HIVE PURE—
CHINA MATING, FRAIL, QUILT—INSTINCT STEREOTYPED—
WINTER PASSAGES—CLEARING ENTRANCE—SNOW—RE-ARRANG-
ING AN APIARY—STARVED BEES—CONCLUSION.

No care during the season of activity can compensate for neglect of the bees' comfort and necessities during the season of repose. A winter well passed has more to do with subsequent success than the inexperienced could well imagine. Setting on one side the misfortune of disease, or the accident of queenlessness, the fatalities which occur during winter may be put down in nearly every instance to one of four causes: paucity of bees, insufficiency of food, want of proper protection, or errors in ventilation. The first of these matters has already received attention under the heads of "Autumn Feeding," and "Uniting." The amount of food required by a stock during the inclement season whilst not raising brood is less than 2lb. per month; but no prudent beekeeper would keep his hives at the brink of possible starvation. A fluctuating, and, on the whole, mild winter, by keeping the bees in unrest, will increase the consumption, while stocks amply provisioned begin raising small quantities of brood soon after the days commence to lengthen. No skeps ought to be left under the weight of 20lb gross, and, unless very small, we advise from 25lb. to 30lb. to be made the minimum, especially if the combs are old and contain much pollen. The food to raise to this weight, if it is not intended to stimulate to breeding (see page 59) must be given quickly and contain 5lb of sugar to the quart of water. With frame hives two superficial feet of sealed store (about three Woodbury combs) are required. With these, hives suffering an *embarras de richesse* may exchange full for empty combs, from poverty-struck neighbours. For too much honey is not really an advantage, since during cold spells the bees thrust themselves into the empty cells, head to head, from each side of the comb, while

others pack themselves closely between them. This matter of food should be completed before the advent of cold weather, for then to have to disturb the stock is most wasteful and damaging, as we shall see presently. If, however, it be necessary to give food during the winter, let it be barley sugar (made as explained at page 47), except that as much sugar is dissolved as possible, the syrup being skimmed during the boiling, which must be continued until if a drop of the syrup be let fall on a piece of glass, it will chip off upon being touched. The stirring must be continuous, as if any of the sugar be burned, the caramel (or cook's colouring, burned sugar) formed, will prevent the bees touching it, while it will cause it to deliquesce and drop down amongst them, gluing them hopelessly together. This barley sugar may be put in pieces into a bottle over the feed hole, or laid across the frames under the quilt hereafter explained, or thrust up between the combs in skeps.

Protection, as applied to skeps, has already received some attention (pages 10 to 12); and frame hives generally leave the hands of the

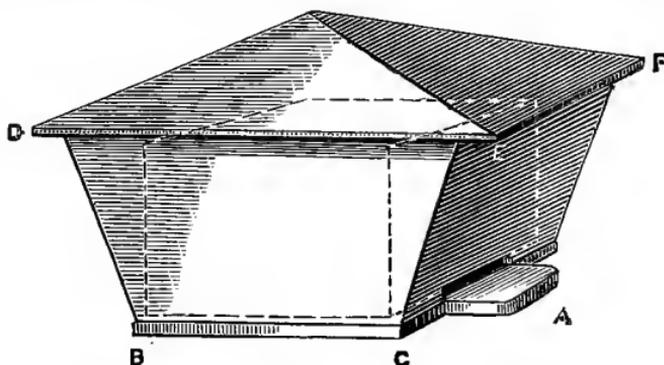


FIG. 59. HAY-RICK COVER (WINTER FORM).

maker thoughtfully provided with every external arrangement necessary to enable them to winter independently; but those who desire to leave on their stands ordinary single sided hives, such as Fig. 11 represents, may, with a little ingenuity, construct those exceedingly useful casings known as hay rick covers, which, while they do not require that finished carpentry which is beyond the capability of the amateur, can be slipped into position without disturbing the stock. A reference to Fig. 59 will show its character. The dotted lines indicate the hive, of which A is the alighting board, and B C the bottom board. The case consists of four sides, which should not be less than two inches wider than the height of the hive; these are arranged like the sides of a wheelbarrow, and are each about 5in. wider at the top than at the bottom. A roof, D, E, F, consisting of four triangular pieces, completes the whole. This is merely lifted on and off, and however rough the workmanship, it may be made

perfectly rain tight by adopting the plan recommended for the cheese boxes (page 10). The case being put on, shaving, rag, hay, or straw is stuffed in between it and the hive, giving a protective covering not to be beaten; over this the roof is placed. For the summer the case is inverted, four little blocks fitted on the inside, enabling it by two wooden bars, to stand as in Fig. 60. Under the roof comes the super while the hive is admirably screened from the sun, and the alighting board from the rain, and near swarming time when the bees are clustering outside, they receive that shelter which many more costly covers could not afford.

As we proceed the necessity for preventing, as far as practicable, the escape of heat through the hive walls will become more apparent. We have still to consider the question of ventilation, *i.e.*, the management of the mouth and the top of the hive. All advanced apiculturists.

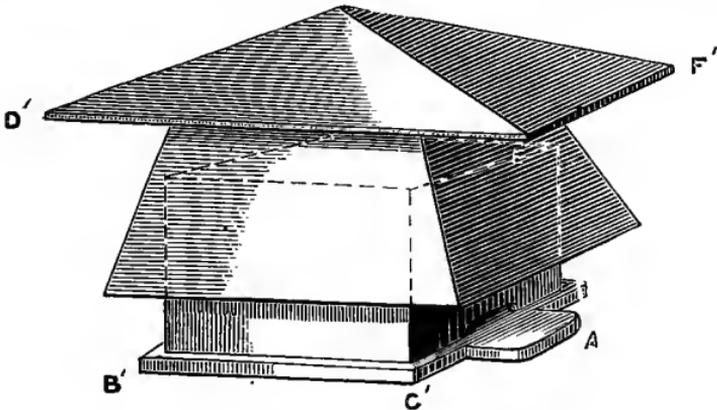


FIG. 60. HAY-RICK COVER (SUMMER FORM).

are now of opinion that ventilation is required during winter, and for this two reasons exist: 1st. Bees are continually charging the air about them with noxious gases, which need removal. 2nd. That ventilation is the only natural means of keeping the hive in a dry condition.

The bees, whilst hibernating, maintain a temperature in the centre of their cluster not lower than 65° , even in the most severe weather. Honey is the material from a change in which, in the body of the bee, heat is produced, as hinted at page 61. Saccharine substances consist of two gases, oxygen and hydrogen, united in the proportions in which they exist in water in combination with carbon, a substance almost identical with charcoal; and although it would not be scientifically exact to say that honey consists of carbon and water, it is sufficiently so for a popular explanation. The bees cluster together, and in proportion as it may be needful for them to evolve heat they elongate and

contract their abdomens (a movement which may be generally seen when any bee is at rest), which movement draws in and expels air by certain holes in their sides, called spiracles, and by which they breathe. The more rapidly this breathing is carried on the more (oxygen) air is brought into contact with the honey they have eaten, the more of it is consumed, and the greater the heat evolved; but as the heat is in proportion to the honey consumed so is it in proportion to the noxious gas (carbonic acid) produced and the water thrown into the hive, as a reference to the rough table, in which the essential oils of the honey, which are very small in amount, are disregarded for simplicity sake:

$1\frac{1}{2}$ lb. honey	{	9oz. water	=	9oz. water.
		6oz. carbon	=	6oz. carbon.
		8oz. oxygen	}	= 9oz. water.
		1oz. hydrogen		

16oz. of oxygen from the air being united with the 6oz. carbon, we obtain 22oz. carbonic acid gas, which with the liberated 18oz. water are thrown into the air of the hive by the consumption of 24oz. of honey.

Omitting to notice the water for the present, let us trace the 22oz. of carbonic acid gas, occupying about twelve cubic feet at ordinary temperatures. In a Woodbury hive, for example, which holds about 1900 cubic inches, the combs, stores, frames, and bees, would fill 1400 cubic inches, so that the air space would not be greater than a quarter of a cubic foot; the carbonic acid, therefore, produced from the consumption of $1\frac{1}{2}$ lb. of honey would fill the available space in the hive forty-eight times. Now is this all: the air is only one-fifth by measure oxygen, the other four-fifths being nitrogen, and the carbonic acid occupies the same space precisely as the oxygen which united with the carbon to produce it, so that we find if the whole of the oxygen of the air introduced had been converted into carbonic acid by union with carbon, the air in the hive must have been entirely renewed 240 times; and, further, the presence of carbonic acid in large amount is so deleterious, even to insects, that probably not more than ten per cent. at the most of the oxygen could be utilised in the production of carbonic acid, shutting us up to the conclusion that the consumption of $1\frac{1}{2}$ lb. of honey needs the passage through the hive of not less than 600 cubic feet of air, or, in other words, needs the complete renovation of the air of the hive 2400 times. We have previously stated the average loss in weight of a wintering colony in which breeding is suspended is less than 2lb. per month, or about 1oz. per day, and this is irrespective of the number of bees, as we shall presently show. 1oz. of honey, or one-twenty-fourth of $1\frac{1}{2}$ lb., requires for its conversion into carbonic acid one-twenty-fourth of 600 cubic feet, or 25ft. of air, or, which is the same thing, that the air of the hive should be changed 100 times per twenty-four hours, or about every fifteen minutes. The escaping vitiated and damp air from the hive carries away

in its altered form nearly the whole of the consumed honey, so we see why, during continued cold weather, stores are reduced, it may be, many pounds while the bees have had no opportunity of discharging themselves. Indeed, it appears that faecal matter is scarcely produced by consumed honey but by the wear and tear of tissue (*i.e.*, of the bee's body) consequent upon activity, and this wear and tear is chiefly made good by the assimilation of pollen. Hence, no doubt, the disturbance of bees during winter, stimulating them to fitful exertion, tends to cause them to consume pollen, and so distend their bowels, and may become a cause of incipient dysentery, as pointed out in the last chapter.

Loss of heat, as the foregoing argument shows, is loss of honey. This necessitates making the hive walls as non-conductive as possible, not only thus saving stores, but the vital energies of the workers, which must otherwise be consumed in keeping up the temperature. We read in the "Handy Book of Bees:" "A continental writer, a Swiss clergyman, has broadly stated that two swarms united eat no more honey than each does separately. This wild notion has now a pretty wide currency, having been quoted by one writer after another. Some experiments have been made by honest men to test the truth of this statement. The results, as recorded, go in favour of the clergyman's opinion." Space forbids our following the rather lengthy remarks of the author; who, after informing us that he discredits the experiments, sums up by saying that "50,000 bees require about as much honey in one hive as in two." To which we must reply, the whole scope of the matter before us tends to show that the experiments only produced the results to be expected. To state that 50,000 bees divided into two stocks would consume no more than they would as one, is parallel with saying that six persons in one room would require as much fuel as two companies of three each in two rooms, each similar to the first; for honey, so far as the adult bee is concerned, is the fuel of the hive, the temperature of which must be maintained at a certain amount. Small stocks on this account winter badly, because the severe exertion in keeping up the heat required of each bee increases the death rate. How good, then, is the economy of uniting weak lots in autumn, while, however paradoxical it may appear, it is nevertheless true that condemned bees added as previously explained (see page 74), cost nothing for their keep, while the bees in the spring not only come out stronger in numbers, but with more freshness and energy individually than they could otherwise have possessed.

The honey not used in building comb or feeding brood, just as truly burns in the body of the bee as does coal in the furnace. The temperature at which combustion is carried on in the latter instance is, really, much higher, but the products and the chemical changes are identical, while the evolution of heat is precisely the same in cause in each instance. A very simple experiment with a lighted candle or lamp will corroborate

this. The material burning is, like honey, composed of carbon, oxygen, and hydrogen; and, as in our table, oxygen united with carbon gives carbonic acid, while oxygen and hydrogen uniting produce water, which may be taken from the flame by passing through it a cold knife upon which the generated water will collect in dew.

Seeing, then, the relation of honey and pollen as heat and flesh formers respectively (see page 61), it is interesting to observe that the larvæ or young and growing grubs as chyle feeders (see page 5) are not producers of heat, and need the brooding of the nurses in order to have their temperature so maintained that the nutritive functions may be continued. A dense comb of grubs is as quickly chilled as a comb of store; and should they be from any cause exposed to a very low temperature, death soon works amongst them, producing "chilled brood" (see page 90). Whilst the population is strong and the external temperature not too low, bees ventilate their hives so thoroughly by placing fanners in different parts, and especially near the hive mouth, to keep up a constant current by uninterruptedly flapping their wings, while they hold on with their feet, that the air of the interior is scarcely less pure than that without. Very strong colonies, if visited at an early hour on chilly spring mornings, will be found pouring out a stream of condensed vapour (popularly steam), while the water from it will continue to drip from the alighting board, and if a lighted candle be placed in the outcast of air it will be at once extinguished. But in biting weather the little labourers, whose earnest efforts to procure an untainted atmosphere may often well shame us, are driven from the door to the cluster, where, closely huddled together, they resist a temperature in which a single bee could no more continue its vitality than could a single coal continue to burn in the firegrate; and, as a consequence, summer ventilation other than that through the hive mouth is not only unnecessary, but would sometimes be prejudicial; but in winter, as the facts just stated show, the case is widely different. Then the cluster, which, as we have already stated, maintains a high temperature within itself, throws up the heated air respired from many thousand spiracles,* and this, striking against the hive roof, if there not allowed to escape, remains until cold to descend upon the inmates. It can only escape at all by the law of gaseous diffusion, which canes all aëriiform bodies to commingle. It at best passes from the door very slowly, and not until the air within is all more or less carbonised. Bees stifled by contracted hive mouths, and all apertures carefully closed above, are in the condition of coke in an Arnott stove with the draught hole closed. The process of heat production cannot go on, and the bees, stupified by

* It is worthy of remark that when the bees thrust themselves into the cells head first the spiracles or breathing holes in the abdomen remain exposed to the air, which passes up slowly through the cluster. Whilst so placed, therefore, their breathing is not interfered with.

impure air and the inevitably falling temperature—for the folly of stopping ventilation to keep bees warm really makes them the victims of cold—drop from their cluster to die, and subsequently to introduce disease by their decomposition.

We have now to consider the second of the two propositions with which we started, viz., that ventilation is the only natural means of keeping the hive in a dry condition. We have already seen that the consumption of 24oz. honey produced no less than 18oz. water, which is given out by the bees in the form of vapour in the air, escaping from the breathing tubes. We, like bees, are continually throwing off by the respiratory process a large amount of watery vapour. In the summer this is held in solution, and is therefore invisible, but on a frosty morning we are reminded of the presence of water by the steamy cloud escaping from our mouths. All this is due to the fact that air is capable of holding more and more water in solution as its temperature rises; and, conversely, warm air, upon being cooled, deposits in the form of dew the water it cannot longer retain. The air leaving the bee cluster, although, as we have just stated, carrying with it a large amount of moisture, is still dry, because its comparatively high temperature would enable it to dissolve still more humidity than that with which it is charged. The whole of this it would carry away in an imperceptible form, and no deposit of moisture would take place if it were allowed properly to escape; but if retained, the hive sides, cooled down by the external air quickly lowers its temperature, and dew, which not unfrequently accumulates into little pools, is formed, and for the same reason that the windows of a warm room on a cold day are often perfectly wet within, because the warm air touching the glass has its temperature reduced, and the water it carries is deposited from it. If no ventilation be allowed, the whole of the air in the hive, except that on the cluster, being in a state of super-saturation, the combs free of bees quickly become coated with mildew. The hive walls, being constantly damp, not only conduct heat with more facility than if dry, but the water upon them acts as a sort of middleman in the transfer of heat to the exterior. Although air when dry is a very bad conductor, when moist it is very freely cooled by a wet surface, so that bedewing the hive increases immensely the difficulty of maintaining the required heat.

This ample explanation of the reasons rendering ventilation necessary has been given in order that the reader may so thoroughly see the utility of the plans now suggested as to adopt them. As a ventilating top cover we still find the substance we were the first to recommend the best of any we have yet tried. Matting, the kind known in the trade as China-matting jackets, *i.e.*, the cases in which China matting is protected during transit—or should the jackets not be procurable, the *bast* (more correctly frail) fish baskets made from these, if unsewn and well ironed,

will furnish covers, at about the cost of 2*d.*, which leave nothing to be desired. It would be difficult to find any material so economical and so well suited to our purpose as this; but almost every upholsterer could supply some thin and comparatively smooth textile fabric made of grass or rushes which would be equally effective in point of non-conductivity and porosity, although, of course, at much greater cost.

If the matting be creased, it should be ironed and then cut, so as to lie upon the frames under the crown board. The latter being removed from the hive, the frames should be cleaned of all fragments of wax or propolis, which would impede the cover's falling into position. One of these should be laid in place, and a moment allowed for any straggling bee to crawl from under it, put a second upon the first, and then replace the crown board,* not fitting it too tightly. Indeed it is well to add a third mat to cover, not only the frames, but the top edge of the hive to prevent the ventilation being too much reduced. Then lay a folded sack over all, or, in lieu of the crown board, a bottomless box the size of the hive top, and four or five inches deep, covered with canvas beneath and filled with chaff, may be placed at once upon the matting. Frail is much more durable and cleanly than carpet, which is often recommended. The bees, of course, cannot bite it, and they scarcely propolise it at all. Some in our apiary, which have stood over strong stocks continuously for more than two years, is nearly as clean, and quite as perfect as when first put on. Carpet, too, when damp, ventilates most imperfectly, and is then very liable to mildew, besides which the bees so coat it with wax or propolis if left on during the summer that it becomes absolutely useless as a ventilating cover for the cold season.

By the foregoing plan of wintering, we get rid of the space over the frames, which is in winter a great damage; but not of necessity always so, as some advocates of the quilt would have us believe. During the season of work in the apiary, we prefer the crown board, because with it we can examine a stock more quickly, and with less loss of bee life than with a quilt. The latter, indeed, if of carpet, gets so sticky, that it is most unpleasant to handle, while it is almost impossible to replace it after its removal without trapping numbers of bees between it and the frames, while immense labour is involved in refixing what we have disturbed. The stock argument that the space above the frames must be wrong because the bees constantly "protest" against it by filling it up with comb, is singularly illogical in those who advocate upward ventilation, since against this the bees protest still more earnestly. Nor is it at all certain that they fill this because they object to a space over the

* We are speaking here of our crown board (see page 20). A wooden top in one piece we have abandoned. If this be the kind used, the bottomless box must replace it, or it must be wedged up about the $\frac{1}{2}$ of an inch at the two back corners.

frames. They leave it open till their hive is crammed with comb; and then utilize it to gain space for storage, as we now believe. If the object were to prevent the circulation of air, a propolis wall would be built, such as most beekeepers must have observed at hive mouths. The fact is, bees in hives are in somewhat artificial conditions, while they are governed by instinct, the nature of which is to be stereotyped, and so to fail often where it is required to accommodate itself to that which is unusual. It is alone the prerogative of reason to vary and adapt. The protests of the bees if always listened to, would abolish movable combs, since they ever strive to fix their frames, and would lead us to believe that orphan colonies having no means of raising queens, ought to be assisted by eggs, rather than by a fertile mother, since they accept the former but refuse the latter. The instructed beekeeper knows, however, that his reason is right while the instinct of the bee is wrong, but only wrong because the circumstances are not natural. The quilt, if found convenient, may be used the year through, since it is in summer, so far as the bees are concerned, neither better nor worse than the crown board. In this matter each beekeeper must consult his own taste.

The heated air rising from each seam of bees in the skep, is not allowed to flow away at once to the unoccupied parts of the hive, as it does in those with frames, because in the former the comb not only is attached to the top, but the sides also as far down as the store reaches. It is in this that the superiority of the skep for wintering bees consists, not in the straw, as we have been so often told. In order to gain this advantage, let slips of wood $\frac{3}{4}$ in. wide, and about five inches long, have tacks driven through them at $\frac{1}{4}$ in. from the end; these dropped down between the frames will be held in position by the head of the tack coming over the zinc runner (1, or 2, Fig. 17). As the matting above, and the slips at the frame ends, will not allow the bees to pass from comb to comb without leaving the cluster, winter passages must be made by cutting a hole $\frac{1}{2}$ in. in diameter, two or three inches from the top of each comb, fitting afterwards into it a shaving, rolled like the side of a pill box, which will prevent the bees refilling it. The slips, too, will somewhat increase the distance between the combs, which facts that have been recently observed seem to show to be an advantage. If a colony in a bar frame hive has to be sent a journey, these wooden slips between the frames will prevent them shifting, and perforated zinc above will supply all needed ventilation. The mouth of the hive during winter should be somewhat contracted; but we do not advocate its being made so small that only one bee can pass at a time. Our first swarm in 1876 came from a hive which had remained open from the previous autumn along its whole front, the front wedge beneath the bottom board having been left out. It had a hybrid mother, and was rich both in bees and stores.

A hooked wire should now and then be passed into the mouth of each hive, in order to remove any dead bees likely to choke it, or stocks may be lost from stifling. When the weather is so mild as to allow of a winter's dance, a walk should be taken through the apiary, and all stocks around whose door bees are not flying should be probed to ascertain whether the exit is free.

Snow should be removed from alighting boards, for although it is not to be feared while light and fleecy, it is likely to get partly thawed and refrozen, when it would work mischief. The glare of the sun upon it, too, will frequently draw bees forth by the thousand, the majority of which will get too far chilled to regain home; by no means confine bees at this time with perforated zinc, or many will die in their efforts to get out, and perhaps choke the opening totally. Stop the glare, however, by placing a board, or fixing a wooden slip in front of the porch, which will also tend to save the inhabitants from driving winds. We believe bees are the better for shading the whole winter through, another reason for which is given in the "Calendar."

The fashion of cellaring bees, so common in America, is not quite suitable to our variable climate, because whenever the thermometer rises to near 50°, the prisoners became excited, and endeavour to leave their hives. The cellars are kept as nearly as possible at 40°, at which external temperature the cluster remains quietly nestling.

In summer our pets having marked their location, will return to it, and not to their hive, if the latter be moved a few yards; and we are often obliged to allow notions of order and symmetry to continue to be violated. About February we should watch the cold spells, since they provide us with the best opportunities for rearrangement, but at these times do not permit our orderly minds to puzzle the bees by giving long and straight lines of similar hives, from which the selection of their own particular domicile must be most perplexing. If we do so, the troubles of queenlessness and robbing are sure to attend us.

If by any mischance a stock should be found apparently starved, try at once a very warm room and food, when often the supposed dead will recover.



Our task draws to an end. May we, before the ink dries in the pen, express the hope that our "Practical Beekeeping" will in some measure increase the home charms of the cottager, and help him to augment his income by wiser methods than those commonly obtaining; and that his more well-to-do brother beekeeper may find through it increased enjoyment and success in the prosecution of a hobby which has furnished to us so much delightful recreation, both for body and mind.

Before concluding we would add that, although time with us is too much occupied to make the task of satisfying the merely curious a pleasant one, we shall be always glad, at Avenue House, Acton, to show, by previous appointment, anything to those interested that may be considered worth a visit; and if we can further assist them with stocks or apparatus, we shall be pleased to do so whenever able.



APPENDIX.

CALENDAR.

THE arrangement of a calendar is necessarily somewhat empirical. The work of one season glides imperceptibly into that of another, while in a climate such as ours due allowance must be made for seasonal fluctuations. It is, therefore, recommended that when a reference is made, the months before and after the current one should receive some attention.

JANUARY.

This is the season of rest in the apiary. Do not needlessly disturb any stock.

Food.—If you suspect any hive to be deficient in store, give barley sugar, placing it in a bottle over the feed-hole (after turning the feeding-stage out of the way), and covering warmly, or under the quilt if one be used, or in skeps, passing it up between the combs: (see page 94.)

Protection.—If an insufficient top covering has been provided, add to it now: (see page 100.)

Snow having fallen, take care that the hives are saved from glare, or many bees will fly, deceived by the brightness, and fall to the ground and perish. Be careful also that snow does not so choke the hive mouth as to smother the stock: (see page 102.)

Entrances should be examined on the first warm day, to see that dead bees are not clogging the entrance; and, if needed, clean the bottom board: (see page 101.) Many dead bees would either indicate an error in management or disease.

Ventilation.—Stocks in frame hives need upward ventilation: (see page 93.) If the crown boards of these have not been removed since autumn, the first time the weather is warm enough to enable the bees to fly they must be lifted, and arrangements made as already explained: (see page 100.) Carpets which have remained on give no ventilation at all, as every pore will have been stopped by propolis.

Insectivorous birds.—The blue tit (*Parus cæruleus*) and the great tit (*Parus major*), driven to extremities by frost, are likely to play havoc amongst our favourites. Adopt the precaution given at page 92.

Mice must be kept at bay by making the openings so narrow that they cannot enter, or the combs may be bitten from their foundations: (see page 91.)

Hives.—Clean, repair, and, if possible, improve all empty hives. These, if sound when thoroughly overhauled and repainted, are better than new, since their joints are not likely to open in the sun. Stippling and varnishing is much better than plain painting. Or clouding may be adopted for variety. This is an American plan, and is thus managed: Paint the hive white, and while the paint is fresh and under cover out of the wind, fix the hive so that the face to be clouded is beneath, then smoke it with a lamp with small wick. A little practice will enable us to produce a very ornamental mottled appearance, not unlike marble; when dry give a coat of varnish.

Bottle covers.—Commission some soft hand to make as many bottle covers as may be needed: (see page 49.)

Jackets for supers may be made at the same time: (see page 69.)

Midribs.—Prepare some casts for midribs: (see page 53.) Instead of taking the first cast in plaster, subsequently baking and soaking in paraffin, as described at page 55, it may be made in gutta-percha if preferred.

Wax.—Prepare some cakes of artificial wax; these will be needed in the spring: (see page 56.)

Make all possible preparation during this season for the busier time, which will bring more than sufficient employment.

FEBRUARY.

Food.—The hints for last month need still greater attention for this. If the weather be so warm as to induce the bees to fly often, much more food will be consumed than if they remain in cluster. Where honey is known to be running short, barley sugar or strong syrup may be given (see page 58); or a frame containing store may be exchanged for an empty one. Remember also that it is much better to anticipate want than bring a stock to the verge of famine. Poor hives will delay in raising brood, and swarm late.

Moving.—Hives can be best shifted short distances for the purposes of rearrangement at this season: (see page 102.) Let it be done during a cold spell. Moving in the summer a yard per day is, however, preferable: (see page 62.)

Artificial Pollen.—If the weather remain open artificial pollen may be given towards the close of the month. Its advantage lies in its being supplied early: (see page 61.)

The advice already given respecting “snow,” “dead bees,” and “insectivorous birds,” will require attention.

MARCH.

Bees, stimulated by their more frequent opportunities of leaving their hives and by the welcome, though small, supplies given by opening snowdrops and crocuses, followed by almond and peach trees, elms, willows, &c. begin now to carry forward the work of raising brood in earnest. Gentle

and continuous feeding must now be resorted [to, to bring the supply without up to the demand within : (see page 59.)

Artificial Pollen should be continued : (see page 61.)

Entrances.—Regulate the entrances according to the strength of the colony.

Bottom Board.—Clean the bottom of all collected *débris*, the bees will henceforward, if in health, act as their own scavengers.

Snow.—Should snow fall, the shading of the hives is more than ever important. If this be neglected the bees will fly during sunshine to die in large numbers. The winter through, hives, during the middle part of the day, should be shaded, especially about the entrances ; if this be done the bees will seldom leave when the air is cold enough to chill them. It is not safe for them to fly if the thermometer stand much below 50° in the shade : (see page 102.)

Purchasing Stocks.—This is the time for purchasing stocks : (see page 73.) Although, as the risk of winter is nearly past, they command higher prices than in the autumn

Borage may now be sown along the hedge rows (see page 58), and a patch of waste ground may be devoted to the sunflower if it is intended to work up condemned bees into stocks. The abundance of pollen thus obtained late in the year is then very helpful.

Wasps.—Queen wasps during March and April may often be seen hovering about the hives. As a queen is capable of establishing a nest with its army of tormentors, let them be diligently hunted and destroyed. Bring them down by a discharge from a garden syringe and crush them.

Hives and Apparatus should be got ready at once. It is better that the hive wait for the swarm than the swarm for the hive.

APRIL.

The beekeeper's season is now open. His favourites are increasing in numbers and activity. The orchard trees at the close of last month and early part of this are in full spring attire, and in favourable weather our stocks are gaining weight, yet, at this time, perhaps, more stocks die of starvation than any other. The winter has disposed of the honey of the previous year, and brood raising now requires a good income to make both ends meet, therefore

Feeding is essential when the weather is unfavourable : (see page 61.) If this be forgotten the beekeeper will probably meet with

Signs of Starvation in the form of the bodies of immature bees on the alighting board. Food failing, ovipositing has been stopped, the eggs and younger larvæ eaten, and the chrysalides (especially of drones) torn from the cells and thrown out of the hive. Feeding immediately will save the stock, but not until it has been thrown back weeks.

Queenlessness may be suspected, if, while colonies generally are carrying

thick, high-standing pellets of pollen, the one under observation takes but a small number of half sized ones. If the hives have movable combs the queen should be looked for; if it be a skep, search for brood, as explained page 28. Should no queen exist, it is generally best policy to unite the bees to another weak stock having a queen: (see page 62.)

Water must not be overlooked: (see page 61.)

Ventilation through the top of the hive may now be discontinued: (see page 98.)

Old Hives needing repairs should have their bees, combs, and frames removed to others.

Uniting is the best course with weak and queenless stocks (see above). One strong lot is worth a dozen weak ones.

Transferring combs from skeps to frame hives may now be undertaken: (see page 75.)

Robbing, if commenced, must be met by the plans given at page 56. King says, "Should a weak stock be nearly overcome by robbers, sprinkle flour upon them; and if they are found to belong to a strong stock, it may exchange places with the weak one."

Exchange of stations is in this case allowable, but a caution had better here be given with respect to it, as it is freely recommended in more books than one as a means of equalising stocks. Never venture upon it without caging the queens of both hives, unless honey is coming in abundantly, or an encasement (see page 83), if nothing worse, is almost sure to follow.

Ligurianising.—If it is intended to use the nucleus plan for Ligurianising, preliminary steps must be taken this month: (see page 81.)

Weeds.—Spread spent tan around the hives to prevent the growth of weeds: (see page 91.)

Supers of glass should be got ready at once, and provided with guide combs and jackets: (see pages 64 and 65.)

Guides should be put into hives (see page 53), and into frame supers: (see page 55.) Our swarms supplied with midribs to within half an inch of the bottom in each frame, fill their hives in a wonderfully short time with combs as flat as a table, and without a drone cell. Some drone comb in an outside frame is desirable.

MAY.

Good colonies are now ripe for swarming, or approaching that condition, and the work of the apiary really commences. If at the beginning of the month a colony with a goodly number of bees be found queenless, give it the queen (see page 83) from the stock you like best (see principle 6, page 46), so that it may raise queen cells (see page 43) for the colonies to be swarmed artificially in ten or eleven days: (see page 46.) Care must be taken that principle 1 (page 46) is not violated.

Imported queens, or other fertile ones, may be given to driven hives immediately after the swarm has been taken—twenty-four hours caging will be sufficient.

Ripe Queen cells should be carefully inserted into all hives soon after natural swarming or forcing : (see page 42.)

Nuclei may be started as soon as queen cells are at command : (see page 81.)

Supers may be put on stocks, all of whose combs are *well* covered by bees if the weather be favourable, swarming being thus possibly prevented ; or, if not, something will probably be stored before the swarm issues. Bees may be enticed into these by pouring syrup into the guide comb, or on to the midribs. They will object to our untidy storing and in putting all right often adopt the super and fill it.

Food is still important in prolonged unfavourable weather : (see last month.)

Swarms, if purchased, should, if possible, be obtained this month. Premature, or vagabond swarms, as they are termed—*i.e.*, colonics bodily deserting their hives through disgust caused by want of, or some defect in the queen—sometimes come off early in May ; they should be joined to some other stock if they do not perform this office for themselves, which is not uncommon.

Drone combs, if found in the outside frames, may be removed and run through the extractor, and a new frame filled with a worker midrib placed in the centre of the hive : (see page 55.) It will speedily be provided with eggs.

Phacelia may be sown and mellilot clover sown or planted out, but the advantage arising is not great enough to warrant occupying any but otherwise idle ground in this way.

JUNE.

Artificial swarming, with a view to profit, may be continued through the earlier part of this month, but until much later, if increase of stock be the object, but food may then be required before wintering.

Feed swarms with regularity : (see page 47.) If the food be supplied too quickly, excessive quantities of drone comb is likely to be built. If our midribs (see page 53) or Long's foundation have been given, this will be impossible.

Regulating combs.—Combs of swarms will require some attention in the way of regulation (see page 50), if guides only have been supplied.

Swarms well supplied with food and midribs should fill large hives with brood and store in from a fortnight to three weeks. As soon as the stock box is really full a super may be placed on ; but it is usually wise, unless honey is very abundant, to wait until brood has been hatching out three or four days.

Casting should be prevented by cutting out all queen cells, but one : (see page 35.)

Drones should be trapped as soon as all your swarmed hives are provided with laying queens. Our drone trap, which the makers supply for 4s. 6d., will save many times its value in honey if applied to a few hives only. Do not put the trap on till a little after noon, choosing a hot bright day, when nearly every male may be had by about two o'clock.

JULY.

This month gives the greatest yield of honey, the supers now growing rapidly heavy, especially if the bees have access to white clover or lime trees. If storified supers be used (see page 65), let the upper ones be removed as fast as filled. This remark applies equally to boxes (page 66), or the amount of surplus will be much reduced. When the honey is removed, and the bees dislodged (see page 68), paste paper over the openings, and store in the position occupied when on the hive, in a dry, cool place.

Gluts of honey will occasionally force the bees to fill up the brood-nest with store ; in this case they hang idle in front of the hive as before swarming. Assist both bees and profit account by using the extractor or smielatore (see pages 69, 70), or place empty combs in the centre of the brood-nest, for which room must be made by removing filled outside ones ; or, as the next best remedy, super at once, giving all available clean empty comb ; but, should the bees already have a well advanced super, add a shallow one to it, combed if possible.

Shade is necessary lest combs melt and fall from their attachments. Light-coloured wooden hives (see page 82), with ventilated super case (see page 23), can hardly suffer in the most ardent rays of the sun ; but with skeps, and the less complete frame hives, leafy boughs will be of service, if no more permanent screening can be provided. *

July Swarms should, as a rule, be returned. They weaken the stock late, so that it will rather require aid than give a surplus (unless heather is near and abundant), while the swarm itself will not have time to gather (except as above) a sufficiency to carry it through the winter. To return it, open the frame hive and destroy all queen cells. Then throw the swarm on to a board, propped up to the entrance of the hive : (see pages 32 and 44.) If the queen be known to be old, destroy all queen cells but one, and throw down the bees on to a sheet a yard from the hive face. Guide them towards the hive, if they need it, by dropping a spoonful or two near the hive mouth. Watch for the queen as she travels over the space intervening between swarm and hive, and remove her. It is more difficult to control swarming in skeps than in frame hives, because we cannot get at the queen cells : with these it is often best to unite a late swarm to another : (see page 62.)

If two late swarms be united, they usually do well, but of course the stocks whence they came are both injured by losing them.

The honey harvest closes in many localities before the end of July, although something is gathered even till far into October. As soon as the incoming is reduced to the level of expenditure, the supers, filled or unfilled, should be removed, or the bees will commence to carry down the honey into the stock hives: (see page 67.)

AUGUST.

Those who are near to heather have yet another harvest for their bees. The moors assume their purple tone in forward seasons before the advent of August. Frame hives had better be prepared for removal as recommended: (see page 101.) Skeps will hardly, at this season, travel safely, unless sticks (see page 49) are run through the combs. They may be inverted and packed as described at page 32; or if, they have large feed and flight holes these can be covered with perforated zinc, and the skep nailed to its bottom board when all can travel *in situ*.

Drones are usually now worried out of the hives. If any colony suffers its drones to live when they have been driven out generally, that colony is probably queenless: (see page 82.)

Supers.—After a super has been removed, cautiously watch the stock, especially in unfavourable weather, or much mischief may arise for want of food: (see page 66.)

Wasp nests should be searched out and destroyed: (see page 91.)

Robbing is now again likely to occur. Contract the openings of the hive generally somewhat, and consult calendar for April, and page 56. All surplus should now be removed early in the morning, or after sunset, and honey must be exposed as little as possible, or temptation will work mischief.

SEPTEMBER.

Pasturage is now scanty, and light skeps may be bought very cheaply of cottagers for transferring (see page 77), and, by feeding, may be made into good stocks.

Condemned bees may now be purchased and treated as explained at page 75. Whilst drumming bees for yourself, explain to the owners the method, and show them the folly of destroying the little labourers in the sulphur pit. You may not be able to make bee masters of cottagers in one lesson, but you can let in some light, and may be, as we have been, gratefully thanked for your kindness, while your willingness to buy what the old system destroys, is an unanswerable argument that there is waste somewhere.

Italianising, by the aid of drones from a queenless stock, may be practised this month: (see page 82.)

Prolong the breeding season by gentle feeding, as bees hatched now will last far into next spring (see page 58), and at the end of the month bring their weight up to that required for wintering.

Pollen.—At the end of the month, on a warm day, search amongst your stocks for combs containing excess of pollen; give these to your condemned bees in exchange for one of their white combs, both will thus be helped immensely.

Artificial pollen may be given to condemned bees now or next month by shaking it into one of their combs, holding the latter in a horizontal position. The bees ram it down and use it, but any part left is very liable to mildew during the winter.

Robbing must more than ever be guarded against: (see last month.)

Where skeps are taken up for honey, fix all their brood combs with upright sticks side by side, and place a hive over all, giving bees to them to hatch them out; then use these bees to strengthen your stocks; but this plan is only to us at the best “new wine in old bottles.”

The fronds of the brake fern may be collected. Draw the hand along the frond in such a way that the rachis (midrib) passes through it. The material will now be sufficiently divided to form a most useful quilt for winter use if sewn up in a cheese cloth the shape of a pillow case. It ventilates capitally, and is avoided by no insect pests. We are indebted for this suggestion to Mr. F. R. Jackson, of Slindon. This braken may replace the chaff advised at page 100.

OCTOBER.

Stocks now return from the moors, and honey for the year is over. Preparations must now be made for wintering. Hives which are leaky in the roof, or in other ways in need of attention, should have their contents transferred to sound ones, for the benefit of the stock on the one hand and the repair of the hive on the other. Carry out the direction given at pages 100 and 101.

Shelter the hives in front, in anticipation of snow (see page 102), so that the bees may not be bewildered about their entrance by new arrangements in colder weather. Narrow the entrances to prevent the ingress of mice: (see page 91.)

Condemned bees, in the first or second week of the month, if strong in numbers, may still be fed up into good stocks, especially if helped with a pollen bound comb: (see last month.)

NOVEMBER AND DECEMBER.

The bees have now retired into winter quarters, and will *require* but little attention, if in good hands, until the end of the following February or beginning of March. Omissions may still, however, be corrected.

Combs for the use of next year's swarms should, if clear from the wax moth trail (see page 90), be carefully packed away.

Wax.—Scraps of all kinds should now be treated as explained at page 73.

Bee paraphernalia should be overhauled, cleaned, and repaired ; and having left nothing to chance which we could provide against, we may in well earned repose, even when the snow drives and the wind whistles, indulge the pleasant reflection that our bees are snug and warm, waiting for the time when they shall again greet their master with their merry hum in the once more strengthening sunbeam.



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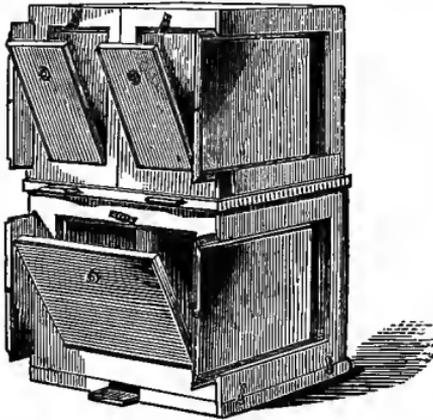
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