

not contain any wax, and the bees are unable to convert sugar into wax without a supply of pollen. Honey and pollen contain wax in infinitely small particles, and the body of the bee simply separates from these substances the wax eliminated by the plants from which honey and pollen have been collected. Wax, therefore, strictly speaking, is not a product of bees, but of plants, the bees merely separating the wax contained in the honey and pollen. An example will make this plain. The cow produces milk, in which fat-globules are floating. Churning, however, does not generate butter, it only unites into a coherent mass the minute particles of butter contained in the cream of the milk. *The relation of the cow to the butter is the same as that of the plant to wax.* As pollen also contains particles of wax, the largest quantity of wax is made by bees during the time when there is plenty of pollen to be collected in addition to a good honey gathering, as, for example, when the rape is in flower. Late in the summer and in autumn when plants are no longer in blossom, and when pollen is scarce, though there is still plenty of honey to be found, wax is produced very sparingly, or the production ceases altogether.

Every animal requires a certain quantity of food in order to sustain life and to continue capable of performing work. This is called the *Erhaltungsfod* (life-sustaining food). If a cow is to give milk, or a bee to prepare chyle and to produce wax, more food than the life-sustaining food is required, and this extra food is known as *Erzeugungsfod* (productive food). Bees are not voracious insects, on the contrary they only consume that amount of food which is absolutely necessary for the support of life and to enable them to perform work. During the time, therefore, that bees neither prepare food for their brood, nor produce wax, the consumption of food is very small. But as soon as wax-making commences, they consume in excess of the life-sustaining food, and secrete wax from this food as well as from the *Erzeugungsfod*. It follows from this that when bees are not building comb they are obliged to get rid, as excrementitious matter, of the wax contained in their food. The bees which prepare food for the brood also produce wax, but if no necessity exists for the production of wax, the wax contained in the food consumed by these bees is got rid of with their other fæces. It need not, therefore, surprise us to find that bees secrete wax when, in exceptional cases, they are obliged to consume large quantities of food, for example, in order to produce heat. This fact has given rise to the supposition that the production, or, more correctly speaking, the secretion, of wax is an involuntary act of the bee, *i.e.* the supposition that in consuming honey and pollen as food for themselves or for the preparation of chyle, bees secrete wax simultaneously as a secondary product.

From an exceptional case, however, we cannot draw a rule. It is the rule that bees produce wax from necessity only, *i.e.*, when they want to enlarge their structure of combs, either for breeding purposes or in order to store honey. The secretion of wax, therefore, is a voluntary act. In order not to be misunderstood, I may remark that the expression 'voluntary' is not intended to convey the idea of a conscious act of the will. All the capabilities of animals have their foundation in inherited ideas. These representations and ideas taken together we call free will, inclination, animal knowledge, or we make use of the obscure and frequently erroneously applied term of instinct.

The wax accumulates on the wax-membranes, or so-called mirrors, in small, thin scales, which make their appearance between the last four rings of the abdomen. The drones having no wax-mirrors at all, and those of the queen being quite rudimentary, the workers alone are capable of secreting wax. The small scales of wax are transparent like bright mica, and are generally of the shape of the wax-mirror, *i.e.* pentagons, rounded off. On

the floor-boards of swarms which have been put into empty hives wax-scales are always to be found, and often in considerable quantity, for, as bees at starting only commence comb-making at a few places, they are unable to use at once the great number of wax-scales produced, and a large quantity is dropped on the floor-board. When bees secrete wax there is always a pretty high temperature in the hive, varying from 24° to 29° R. (75° to 84° F.). This rise of temperature is caused by the bees themselves; the influence of the temperature of the external air upon the interior of the cluster of bees, in case the hive has been properly constructed, being scarcely worth mentioning. If the colony is small and in too large a hive, or if a badly constructed hive allows the heat to escape and cold air to enter, the bees make an effort to raise the temperature to that degree which is necessary for the secretion of wax. Colonies in hives which are not sufficiently warm secrete but little wax, and consequently do not make much comb. When thin-walled hives are exposed to the heat of the sun the temperature inside may easily rise to 30° R. (86° Fahrenheit); and as soon as this degree is reached the bees are obliged to discontinue all work, as otherwise the temperature would rise still higher, which would cause the wax to become soft and the comb to break.

When the transparent wax-scales are bent or broken or kneaded they lose their transparency and gain the appearance of comb-wax. Originally all wax is white; in the summer, however, the delicate white-comb soon turns yellowish, the pollen being the cause of this yellow colour. Pollen is generally yellow-coloured. Escaping from the melliferous plants it drops upon the nectar, giving it a yellowish appearance, and the bees then remove this yellow nectar with the grains of pollen contained therein. The colouring matter contained in the honey colours the honey-cells of a yellowish colour; the evaporation from honey, of course, also imparts a yellowish appearance. That this is the case may be observed in the small crevices of doors through which the exhalations of bees escape, making the wood appear yellow; the yellow colour does not merely adhere to the outside of the wood, but penetrates it to a considerable depth. It need not, therefore, surprise us to find that these exhalations also impart a yellow colour to the wax. The correctness of this view of the case is obvious from the fact, that in autumn and winter, when bees no longer store honey in recently-made combs and consume very little pollen or hardly any at all, the exhalations from their bodies also being much less than when in an active state, white wax inserted in the hive does not become yellow-coloured, even if surrounded by the bees.

ABBOTT'S ANGLO-GERMAN HIVE.

Dr. Dzierzon, in his *Rational Bee-keeping*, devotes many pages to a description of the Twin-stock hive, and its superiority to all other German hives. This superiority has been acknowledged by the majority of German bee-keepers, seeing at their conventions at Dresden, Breslau, and Stuttgart, it has been awarded first prize. Dr. Dzierzon says that this hive 'combines the greatest possible advantages with the utmost simplicity, and leaves nothing more to be desired.' Mr. Abbott has not servilely copied the German hive, but, recognising its value and its adaptability to the requirements of English bee-keepers, has transferred its leading principles to his new Anglo-German Twin hive. Mr. Abbott's description of it is as follows:—

'It may be worked on any principle, being equally well adapted for the supering, the extracting, the divid-

ing, the doubling, the collateral, or the longitudinal systems, and is the best hive for each purpose, yet is so simple that a child can scarcely mistake its uses. It is specially adapted for perfect wintering, provision being made for the easy application of loose packing of any kind. A novel feature in its construction consists in the moveable dummies being in the front of each brood-nest, so that the bees of both colonies are, in winter, crowded against the single divider for mutual warmth, and to be as far as possible removed from outdoor influences, the spare space in front being packed in any approved way. It can be instantly made of any capacity consistent with its size, and is therefore suitable for any locality. It is intended to contain two stocks of bees, giving to each space for fifteen frames, thus being equal to two complete hives at the cost of one. These two stocks being put close together for the economisation of heat, the front parts of the hive form splendid porches for the protection of alighting bees. This feature is quite new, and is highly successful. The hives may be worked equally well on the commonly known principles if preferred. For queen-raising provision may be readily made for nuclei on either side of the centre divider, where they will be perfectly warm and comfortable.'

Fig. 1 represents the exterior of the Twin-stock as represented in Dzierzon's *Rational Bee-keeping*;

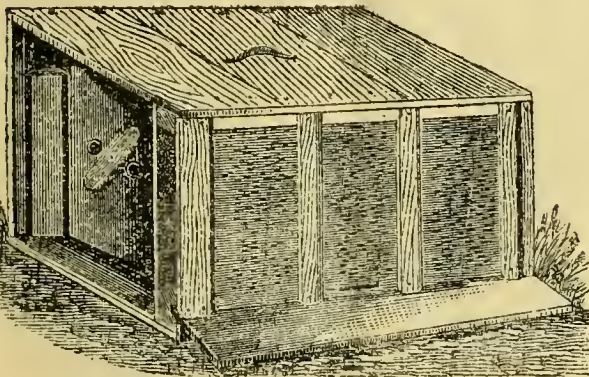


Fig. 1.

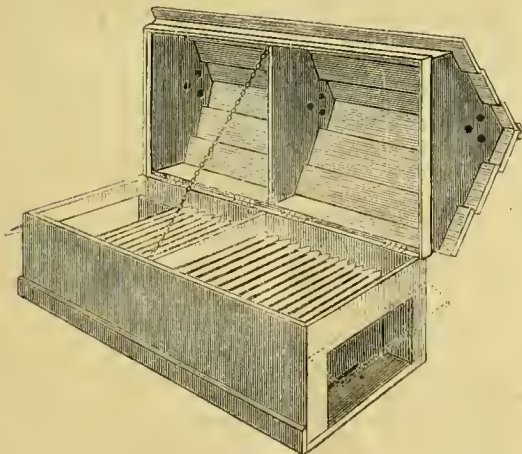


Fig. 2.

Fig 2, the interior of Mr. Abbott's Anglo-German Twin hive.

AN EXTINCT ORDER OF CHIVALRY.

In an interesting notice on French Orders of Chivalry, past and present, a writer in the *Journal des Débats* mentions several which bore the names of different animals, such as the Orders of the Hedgehog, of the Dog and Cock, of the Dove, of the Bear, of the Lion, and of the Honey-bee. The last-named has a very curious history. The medal of the Order had on one side a hive with the motto, 'Picolasi, ma fa pur gravi le ferite' ('Small, no doubt; but it inflicts a sharp wound'), while upon the reverse were the head of the Duchesse du Maine and the following inscription in capital letters, 'Anne Marie Louise, Baronne de Sceaux, directrice perpétuelle de l'Ordre de la Mouche-à-Miel;' underneath, 'Sceaux, 11 Juin, 1703.' This was the date of the foundation of the Order by the Duchesse du Maine, a granddaughter of the famous Prince de Condé, whose husband purchased the Château de Sceaux in 1700. The Duchess, who was very fond of amusements and ceremonial, made Sceaux the rendezvous of the most brilliant wits of the day, and in 1703 she instituted this order of chivalry, to which persons of both sexes were eligible. The members of the Order were expected to appear at all the entertainments given at Sceaux, the men wearing a tight-fitting costume of cloth of gold sprinkled with silver bees, and a head-dress made to imitate a hive; while the costume of the ladies consisted of a dress of green satin embroidered with silver bees, a mantle of cloth of gold, and a diadem formed of emerald bees. The oath of fidelity which had to be taken by each new member was as follows:—'I swear by the bees of Mount Hymettus fidelity and obedience to the perpetual mistress of the Order, to wear all my life long the medal of the bee, and to comply with the statutes of the said Order. If I am false to my oath, may the honey turn to venom, the wax to tallow, the flowers to nettles, and may the hornets and wasps sting my face!' After her husband's death, the Duchess did not name any fresh members; but when conversing with Fontenelle, who, together with Voltaire, Marivaux, and other wits of the time, used to visit her at Sceaux, she expressed her regret that he had not been among her earlier friends, as she would have liked to have conferred her Order upon him. Fontenelle remarked that he would have been ill at ease with a hive on his head, as it must have been very much in the way of the cavalier and of the flower about which he was flitting. To which the Duchess rejoined, 'Not so much as you may imagine; for surely the flowers bend down to the kiss of the bees.'—*Daily News*, Nov. 21, 1882.

BEES; THEIR HISTORY, MANNERS, AND CUSTOMS.—A lecture with this title was given in the Free Hall, Melksham, on Monday, December 11th, by the Rev. J. Brown. There was a large attendance; the Vicar (the Rev. Canon Warre) presided, who briefly introduced the lecturer. Mr. Brown then addressed himself to his task. First of all, he had to perform the pleasant duty of thanking the kind friends who had assisted him in various ways, and the result of whose labours was apparent in the diagrams and illustrations which have been freely supplied, and in the models of hives of the 'bar-frame' system, the supers, straw skeps, extractors, &c., arranged on and in front of the platform. Among the chief contributors may be mentioned Miss Warre, who had very kindly furnished drawings of the larva of the bee, the foot, sting, &c., and Messrs. A. Adams, Mansfield, and Child, who not only provided specimens of the hives and other apparatus, but showed their use, as in the case of the extractor. There was also a number of beautiful diagrams kindly lent by Mr. C. Tite of Yeovil, and Mr. W. H. Dunman, jun. Troy Town, Dorchester. The lecture, which was listened to with great pleasure throughout by the large audience, dealt first with the interest which has always been taken in the honey-bee