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THE "BUGOLOGIST"

AND

THE CHILDREN.

BOOK I.

BY

PAUL VANDER EIKE.



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P R E F A C E .

In the compilation of this little volume the author does not claim *entire* originality ; it is, however, principally my own experience in collecting and observing the beauties of Nature, as shown in the study of Entomology. There are a number of books on insects but only a few can be read understandingly by the younger people of our public schools, therefore, to increase the few, is this book.

Full credit is hereby acknowledged to Packard in his "Guide to the Study of Insects," Steele's "Fourteen Weeks in Zoology," and many good suggestions given by Professor N. M. Eberhart and various other friends of Nature. I hereby wish to extend my sincere thanks to each and every one for aid that I have received.

PAUL VANDER EIKE.

LAKE MILLS, WIS.,

MAY 24, 1892.

PART ONE.

SECTION I.

THE BEES.

(a) THE TAME BEES.

Let us go to the pasture and gather flowers. Remember to keep both eyes and ears open.

Here we are.—Oh, what a sweet smell these buttercups have! Just look! The field is yellow. But do you see only buttercups?

No. Grass, of course, also.

Now look again. What is that that just alighted upon the flower before you? Put your hand over it and see what it will do. “Bizz-z-z-z-” it says.

If you will handle it carefully, it will not hurt you in the least, but if you squeeze it the least bit, you will be rewarded with a sharp prick in your hand and, on opening, you will find a little kind of thorn, which is the sting of the little insect.

If you were in a country in which there lived many giants of whom you were very much afraid, you would probably carry a pistol or a knife to protect yourself, would you not? These little insects use this sting to pro-

tect themselves not only against giants—the people—but also against other insects or animals that might attack them.

The little yellow creature that we see, is the Honey-bee. Most of these bees die when they lose their sting.

Now what do you think it is that makes your hand swell so after being stung? In the body of the bee, behind the sting, is a little sac containing poison which runs into the sting. Thus the poison gets into the blood with the sting and causes the little blood-vessels to increase in size and we say the hand is swollen.

Watch the bee very closely now while it “sucks honey,” as you say. See, how quick the little “trunk” moves up and down in the flower! But, I must tell you that this is not a trunk. It is a tongue, and the bee laps up the “honey” just as a cat or dog laps milk. This tongue is long and hairy, well suited for the purpose.

Now, the “honey” that you sometimes found in clover is not honey; but the bee, after lapping it, turns it into honey. The sweet sap in the clover is called nectar.

But nectar is not all that the bee gathers. Look at the legs. You will find, though they were black before, they are yellow now. The bee has covered them with a yellow dust from the flower, called pollen.

Having "bag and thigh" loaded the little fellow rises into the air and flies directly home. Let us follow it to its house.

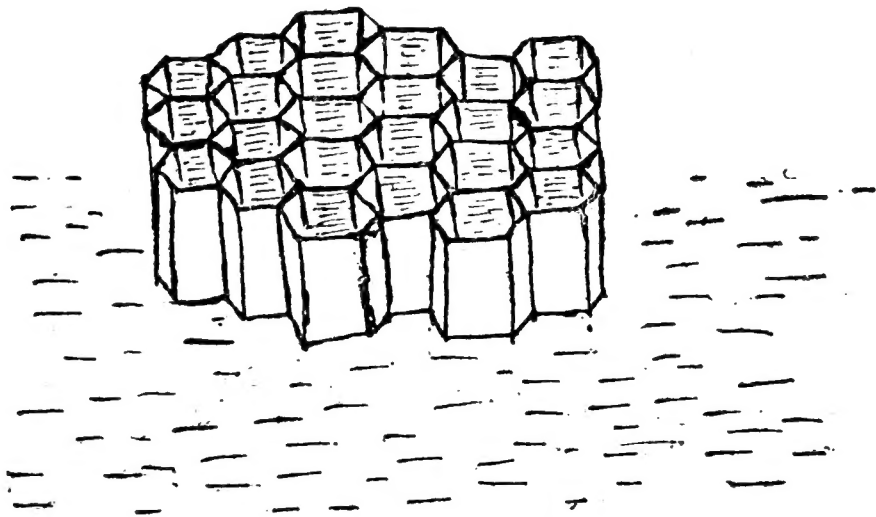
A little six sided box with a few frames inside is the home.

Ah! but look inside! Is there only one? No, there are hundreds, all of which help to make home pleasant.

You probably have seen honey in the combs in the store. How wonderful it is made! Some people have tried to make something like this but the "little busy bee" has the "drop" on us there. No one has ever succeeded in making comb-honey.

Let us look at some genuine comb-honey.

Notice that each little cell has six sides and the bottom made of three pieces. It is so made that on the



Cells of Honey Bee.

opposite side three can rest on the bottom of one on this side. Thus the bottom of one form parts of the bottoms of three other cells on the other side. Everything so neat and so strong it could not be any stronger.

What do you suppose these cells are made of? Well, you'll say wax but where do the bees get the wax? They make it of the nectar they gathered in the fields. They sweat it out of their bodies. Now, that seems strange but it is true. For that reason we give them foundation upon which to build new cells so that the bodies will not be so exhausted and be abler for gathering honey.

Some men who have studied carefully the habits and modes of living of the honey-bees tell us that some of them are honey-gatherers and some of them wax-producers and still others are nurses waiting upon the sick.

Did you ever dream of such things among insects?

When the cells are completed the honey is put in them and they are sealed in the neat way that you see them here or those that you saw in the store.

The pollen put in separate little cells and is kept for food.

One thing more about the tame bee and then we will again go out into the field and visit the wild brethren.

Each colony, as the collection of bees in one hive is called, has a kind of leader called the queen. When the

colony has increased considerably in numbers, the queen together with the old bees takes leave to establish a new home, leaving the young bees to take care of themselves. In nine days the young swarm will have another queen and matters will go on as before the old queen left.

Generally, the runaway bees are caught and caged in a box like the one they were in before, but some times they get away. They then try to find some hollow tree in the woods or some other place of safety in which they make their home.

In India there lives a Honey-bee, much larger than ours, that builds the comb right around the branches of trees. This bee can gather a great deal more honey than ours can but no attempt has been made to bring it to the United States or European Countries.

We must now visit the field again.

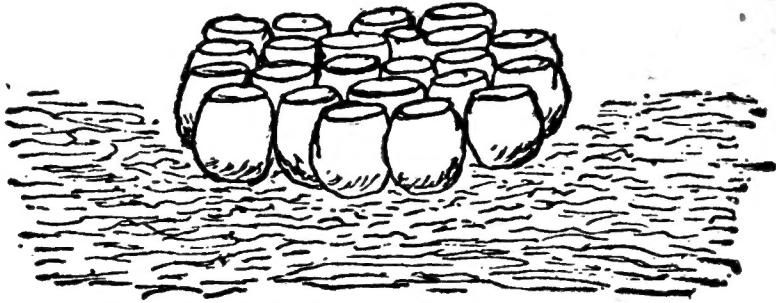
THE WILD BEES.

1. *The Humble Bee.*

Here we are again in the open field. It is about harvest time.

Boys, I know of a "Bumble-bee" nest, let us go to rob it. Perhaps it seems cruel business, but who of the boys has not at some time indulged in it? I think none.

First I shall tell you something about the origin of the name. Humble-bee is the proper English name but



Cells of Humble Bee.

the latin name is *Bombus*. Hence we have changed the latter to *Bumble* and annexed the word *bee*.

There is a nest under yonder rail-fence, let us take that.

The first thing we see is a round ball of dry grass, tucked away under the rail and kind of hidden. Touch the ball. See, how they rush out! Do not move and they will not notice you but if you run you will be stung.

Now, let us in some way get the nest. We'll not be cruel but we'll capture the whole swarm in a bag and take the nest and examine it.

What does it look like? Not like the one of the tame bees. The cells look like little bags and are not as neat as the six-sided ones of the tame bee. Perhaps it may seem curious how the bees ever get the dried grass together for the nest. I shall explain.

Unlike the Honey-bee, all the bees of the colony

except the queen die in the fall. In the spring the queen awakens from her long sleep and immediately searches for some place in which to live. She generally selects the abandoned nest of a field-mouse, which this is. Sometimes gopher-holes or openings under stumps are selected. She then gathers a little honey and pollen and lays her eggs. They are all laid together in one mass and covered with the pollen and honey. It is hard to tell just how long it takes them to hatch. The several changes, (of which more hereafter), which take place in the hatching of all insects, seem to be so gradual in the Humble-bee that it is hard to tell where one begins and the other ends.

As soon as the little bees, which now have the shape and appearance of a grub, are so that they can move, they eat the pollen that is around them. They now grow very fast and separate, each making large cavities in the pollen mass. When they are full-grown, each spins a silken wall about it, somewhat as the larva of a butterfly does. This wall the old bees make stronger by covering it with a thin coating of wax.

The grubs are called *larvæ*, one is called a *larva*.

The *larvæ* now change to another stage, called the pupa.

You have seen the pupa of butterflies and moths

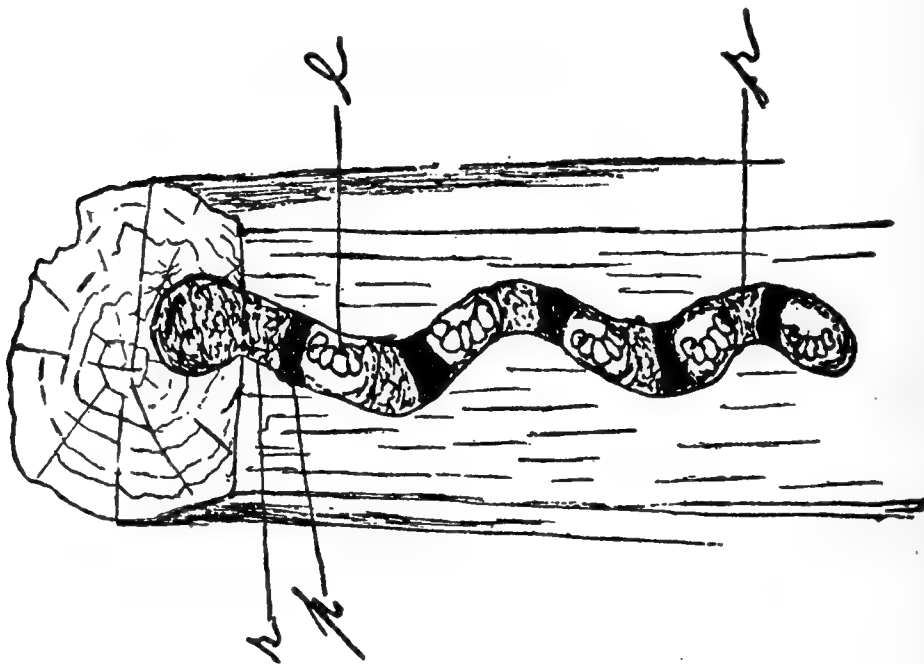
before they were hatched. The pupa of the bee is similar: it cannot move. After a few days this seemingly lifeless creature has head, body, and limbs, all complete. The insects then eat their way through the cell-walls and appear as workers, small females, or queens.

Now I have told you nearly all that will interest you. We will, now, look for something new.

2. *The Carpenter Bee.*

Examine closely the rail-fence near the Humble-bee nest and see if you cannot find a little hole somewhat like one made by some boring worm.

Here is one. Let us watch it for a time.



The Home of the Carpenter Bee.
There! did you see?

I have closely watched this nest for more than three months. Let us now take it and examine it. For convenience we'll break the rail so as to see better the house that this little carpenter has built, for the insect is the Carpenter Bee.

Why, the hole is almost filled up! How could that little thing turn around in there? And where did she get those fine chips? Is the entire hole filled up with chips? We shall wait until she returns, perhaps she can tell us where the chips come from.

Ah! here she is. Let her enter. I'll now give her some chloroform and we can examine her closely.—Look at her head. She has a pair of strong pinchers or *mandibles* as we call them. It is with these that she tears off the little chips in the nest. She is about as large as the Honey-bee but must be a great deal stronger. See, how ironry her black abdomen appears.

We'll cut up the rail so we can see the nest better.—The hole is about four and a half to five inches deep. It does not pass 'down straight but in a winding way. At the bottom there is a thin layer of raspings upon which is a larva. Then another thin layer of raspings and above this, pollen. A thick layer of raspings covers the pollen; another larva with a pollen-mass above it is next in order. Five larvæ are here. Too bad I have

spoiled those three! Well, two are enough as specimens for a collection.

This is the home of the Carpenter-bee. One long hole and that hardly large enough to turn around in. But there are only one or two to live in this house, so, of course, it need not be large.

We'll now bound over the rail-fence, into the woods, and see if we can find a still stranger but larger house.

3. *The Paper Wasp.*

Ah! we do not have far to go. I am certain, in yonder hazel bushes we will find what we wish to see.

Look among yonder cluster of bushes. Do you see that large, round, gray ball, about as large as a peck measure, or more like a foot-ball?

That is the nest of the Paper Wasp.

Why, it is all one round ball closed on every side! How can the bees get in?—

Let us go nearer and see.—See. There are bees flying around it. Watch them.

Oh, yes. There, on the lower side of the oval ball, is a round hole, large enough for two to enter.

It seems cruel to chloroform them so as to get a peep at the inside of their house. In fact, I hardly think we can do it. Perhaps we can find a nest that is abandoned.

But all that I have seen this summer, so far, have been full; so I hardly think we can find a single vacant house.

We'll start a fire under the nest, and smoke them out.

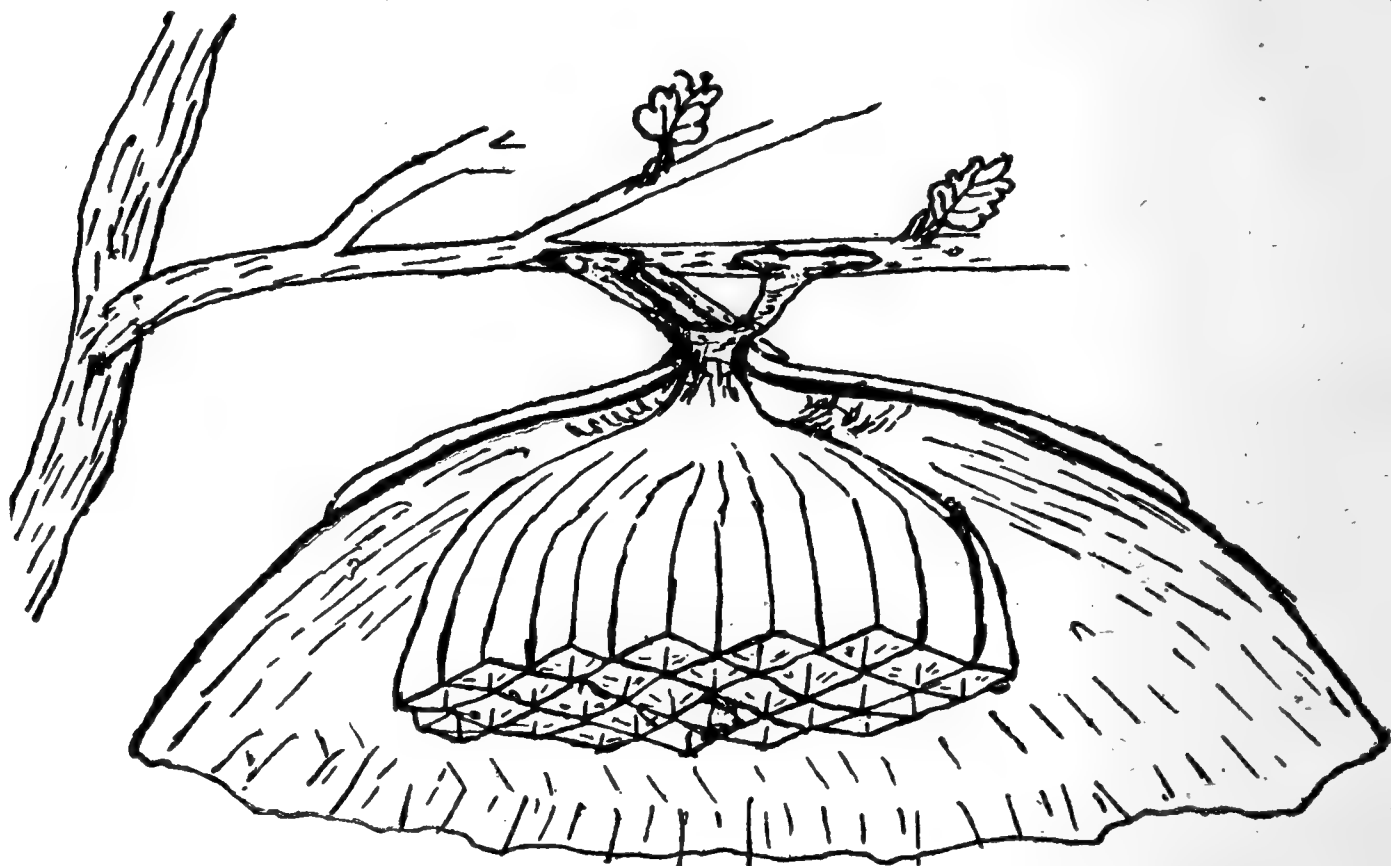
See, how the smoke overpowers them! It makes them "drunk," suffocating them. Now the "yellow jackets" have all gone out. See them crawling about as though they were hardly alive.

Early in the spring I went by here and found these bees in almost the same condition. You can see, in a few places on the side, spots as though holes had been there before. I did find holes there, then. I took the trouble to follow up one of these holes and found some of the bees between the layers of the paper walls.

But the little fellows were so stiff that I thought they were dead. I took a few of them home and placed them near the stove. Soon one of them began to move his feelers as though feeling around in the dark for something to eat. It did not take long before the legs began to move and the little creatures began to crawl, so that I had to put them out of doors. I have two in my collection now. They were not dead but asleep and, when brought into the warm they awoke. Does it not seem strange that they, in fact nearly all insects, should have such long time to sleep,—more than four months.

Look there. Right near this large nest is a new one started. There must be two colonies here.

A kind of shell-like roof has been made. It looks almost like half a clam-shell except that it is deeper and



The Clam Shell as we saw it on the Hazel Bush.
in the center combs are started. That is how the house
is begun.

Let us now carefully peel off the walls of the large nest. What are the walls made of? Why, it is paper! And these insects have lived long, long ago, probably before man ever lived. So you see, men have been the inventors of many, many things but I think the insects have made the beginning there.

The paper is made in a similar way that we now make paper. Rotten wood is chewed and mixed with saliva, thus forming a paste which dries into paper. The paper of these few cells in the middle of that little nest is not made in this way. You notice it appears of finer quality. It is made in a similar way that the spider makes his thread; that is, it is a secretion. The bee, however, has no spinnerettes.

Tear away the whole side. Notice the layers of comb. Nine stories are in this house, although it occupies so small a space. Is there honey in it? Yes, there is honey, but I do not think you would want to eat it, for some people even say it is poisonous.

But there are high-capped cells near the middle of each story. What are they?

Ah! Open them.—There are little worms in them. Yes, the little worms are larvæ of the bees,—they are young bees. These larvæ or grubs will soon change to the pupa state and then the full-grown bee will be the last stage.

Thus we have found the first paper-makers, in the woods. We'll now go home and see if we can find something else of interest in the old blacksmith shop. But let us take a few of these fine oak apples with us.

Now I'll see if you have your eyes open.

When you pick them, do you stop to think why it grows on the leaf and not on a stem by itself? You say, they are not a fruit of the tree. That is right.

A little insect, belonging in the same order with the bees, lays eggs under the thin skin of the leaf. The cells of the leaf then increase very fast around the eggs thus forming the apple. The insect is called the Gall-fly.

4. *The Mud Wasp.*

We now have reached home. Let us immediately go into that old building and see what we can find.

How old everything looks! You can see the daylight through the chinks in the roof. But hark! what noise do we here? Does it sound much like the music of a mason? It is, however, a mason's voice. Wait a minute or so and you will see him.

See? There he (or rather she) goes. Did you see her long yellow legs? Her body is of a darker color. If you will go out to the well or some little pool of water, you will probably see her with some of her relatives, picking up little particles of mud and drinking water, (if I may call it so).

Let us now search for her nest to see what she does with the mud.

Look in the corners, under the eaves, back of the spars, or behind that tin pan leaning against the wall.

Aha! Here it is behind the pan. She likes to hide herself.

Let us take a nest that seems to be abandoned, for there are plenty of them here.

Clay seems to be the make-up of the walls of the house. But it is strange how the little workers could have gotten together so much material. Here however is a good lesson—it was done little by little. By small pieces the dirt was brought and stuck together, not all in one lump. So it is in life. No great thing has been done with unusual exertion but it has been done little by little. There is a similarity between the Mud-wasp and Paper-wasp in that the eggs are laid in separate cells or apartments, not like the Humble-bee which lays all its eggs together.

But very unlike the Paper-wasp, its humble, little home is a "clay house." In the little chambers of the house are the eggs, one in each chamber. Carefully break away the outside wall. Notice the brown cocoon. Tear it open to see what it contains.—At one end, the grub of the young wasp but that does not fill up the whole chamber. At the other end are three or four little spiders which I think, are intended for food for the little wasp when it is old enough to eat.

This bee seems to be alone, also. Do you remember

what other bee lives alone? Oh, yes, you remember. The Carpenter-bee is the one. When you watch the Mud-wasps by the mud-puddle you think there are swarms of them but there are not.

Let us now recall all the insects we have watched and know something about.

There is first the Tame bee of which everybody knows something; then the wild bees.—The Humble-bee, (*Bombus*), the Carpenter-bee, (*Xylocopa*), the Paper-wasp, (*Vespæ*). Then we noticed also the work of the Gall-fly. If you will open the gall-apples carefully you may succeed in finding a larva and possibly an actual specimen of Gall-fly.

Of course there are many, many other kinds of bees, but I have not time to tell you all now. There is however another family of insects, belonging to this same order—the hymenoptera—of which I must tell you—the ants.

THE ANTS.

One more family, belonging to the same order with the bees, we shall try to find out something about them and then go to another order.

We still are in the shop. My brother once kept honey here and probably a few stray drops have fallen

upon the floor. Do you see those little six-legged creatures crossing the floor? Now they enter the crack. Of course, you know their name? But I am about to tell you about a kind of ant that lives in trees. We'll go out to the wood-pile and perhaps we can find one of the nests of the species called *Formica Pennsylvanica*. *Formica* means ant, hence this is the Pennsylvanian ant.

Oh! all the nests are abandoned. None, filled with insects, is left for us. We must needs go to the woods in order to watch these little fellows work and learn something of their society. So let us be off.

Here we are at the base of a large Oak-tree. By some accident the tree has become hollow, not so much that only a thin shell remains but enough so that ants can enter and make their home. Possibly the ants bored this themselves, for, as we shall see, their mandibles are more formidable compared with the size of the insect than those of any other insect.

Strike a sharp blow upon the trunk of the tree.—There.—See them come out. Now here is a chance to learn a great deal by observation and thinking a little at the same time.

Notice. How some of the ants are busy, carrying bits of straw, minute chips, and other things! Notice, also the size of these insects that are carrying things.

They are the smallest in the nest. Strange, that the smallest should do all the work but they do and that without grumbling, as you can see from the way they work.

Oh, but who comes here? A big black spider is going to attack this weak little worker. There! he is trying to take the fly that the ant has caught. Well, the little ant hangs on but the spider fairly drags him away. But, never mind, Mr. Spider, you'll be driven away before you know it. At last.—After he has dragged the little thing for more than a rod, the ant lets go and hastens back to his home.

He enters the house. Something happens within, for a whole regiment of them comes out and starts in the direction the spider has run. These ants, however, are larger and stronger. It must be that their business is to watch and protect the house. So it is. They are soldiers and they are now in pursuit of the spider.

The spider has hidden behind a little tuft of grass, where he thinks himself quite safe. But the soldiers move so quietly that he does not hear them, until they have almost surrounded him. Now he is frightened and tries to escape. In his haste he loses his prey, which the ants take. As he passes over the army, for he is much larger than the ants, the gritty, little fellows snap and jump at him but he makes good his escape.

They got, however, what they wanted,—the prey and so they take this and go home. They think they have done enough, to get back what they lost, so do not pursue the spider farther. The spider in turn is glad to get out of reach of the terrible fangs (*mandibles*) of the ant.

Thus we have found two kinds of ants in the same nest, soldiers and workers. But there must be some others, for we know that there is no family without a father or mother. So let us look for something of that sort here.

Aha! there is one that rarely shows herself. That is one of the females. There are more than this one in the nest. Notice that she has wings and that her body is a little larger than that of the rest.

Ah, there comes another with wings but considerably smaller; that is a male. Strange there should be so many mothers and fathers in one home is it not? However, our Creator has so arranged it and it is all very good.

So then in one nest there are four different kinds of ants,—workers, who do all the work, soldiers, who watch for outside enemies, and males and females.

Now in the fall of the year all the ants that have wings fly out into the open air. You probably have seen

them yourself before this. When they settle again many new homes are established.

Now we must for home. On our way, I'll tell you an interesting ant story. A friend of mine who lived in California a number of years told it to me. It is what he himself has seen or I should not believe it. But it must be true according to his tell. He says :

“It was quite early in the morning when I had started for one of the mining camps up the side of the mountain. As I was walking along the foot of the mountain in a well-trodden path, (so common among the hills,) I noticed a few ants crossing my path. I looked farther back in the direction in which they came and saw not only a few hundred but thousands.

Well, I had always heard marvellous stories about ants. One man told me he had a pail of syrup in his pantry and somehow the ants got at it. He took the pail and hung it up by a string fastened to a nail in the ceiling. Later in the day he, by accident, saw one ant descending the string. About an hour later the string was black with ants and a broad band of ants stretched across the ceiling. The single ant had in the course of only one hour brought up hundreds.

Now, thinking this some what fabulous I determined to find out for myself.

I looked ahead in the direction the column of soldiers was moving, and I saw in the grass a large *tarantula*, about as big as my hand. The spider was no more than six feet ahead of the ants, but he seemed not to be afraid.

Perhaps, if Mr. *Tarantula* could have seen himself before hand as the ants saw him afterwards, he would have made good his escape; but he was too proud to think of running away from a few ants.

The whole scene was a Thermopylae. *Tarantula* was Leonidas and the ants the Persian host, but the battle lasted only twenty minutes.

Bravely did the spider fight his enemy but its numbers were too many. It was of no avail. It was fun to see. Well, perhaps not fun but admirable to see the little fellows climb up the legs and attack him in every place you can think of.

After the battle, there stood Mr. *Tarantula* in the same attitude, his fangs ready to take whatever may come, but he was a lifeless figure. It seems the ants wanted to take revenge for the very hair were pulled out and he was bitten in every conceivable place.

But the ants did not pass without loss as you might have seen by the number of dead that lay strewn about the corpse of the *Tarantula*.

SECTION 2.

BUTTERFLIES AND MOTHS.

(I.) BUTTERFLIES.

In our rambles in the last section we watched especially those insects belonging to the great and intelligent bee family,—the Hymenoptera. On our travels in this section we shall take especial notice of those beautiful insects that you probably have uselessly chased a good many times, the Butterflies and Moths.

It is the month of June, late spring, when Nature is most beautiful. Let us go forth again “under the open sky and list to Nature’s teachings.”

We are in the clover field. At once, our eyes fall upon a living creature that is making its way, as it appears, toward the cabbage-patch. A worm about two inches long, all covered with hair of a dull green color, with six feet near its head, and six other little things like feet near its posterior end, is hying with all its might through the grass.

Well, now, he can move quite fast, can’t he? He is not a snail; he moves too fast for that. You have heard and spoken his name so often that I hardly need tell you it is a caterpillar.

This caterpillar, like every other caterpillar, is always hungry, always looking for something to eat. You

can think how much they eat and how fast they grow when I tell you a little about the larva or caterpillar of the Silk-worm.

When it hatches out it weighs about one twentieth of a grain ; when ten days old it weighs one half a grain or ten times its first weight ; when thirty days old, thirty-one grains or six-hundred twenty times its first weight ; when fifty-six days old it weighs two-hundred-seven grains or four-thousand-one-hundred-forty times its first weight. Just think ! If we should ever grow to weigh four-thousand times our first weight, what clumsy things we would be. The caterpillar lives to eat, so to speak.

But his life is not long. After a few weeks he will be asleep. What ! Asleep in summer ? Yes, in summer.

The eggs of this one are laid on the under sides of turnip-leaves. In about three or four days they hatch. The larvæ or caterpillars then live for about three weeks. And after that, fall asleep for about three days. On awakening, do you think they will awaken caterpillars ? You will be surprised when I tell you no. They will be butterflies when they awaken.

This larvæ is one of the kind known as the Cabbage or Turnip butterfly. It will turn into a butterfly like that yellow one or that whitish yellow one before you.

How pretty they are! The larvæ are, however, very destructive,—they eat the leaves of the plants and when the leaves are gone, unless there are a few new buds, the plant cannot live, for the leaves form the lungs of the plant.

Catch the butterfly that is near you and we shall examine him more closely.

Notice his feelers, the kind of horns on top of his head. They have little clubs at the ends. That is what distinguishes the butterflies from the moths. The moth's feelers or *antennæ* have no little clubs at the ends but taper to a point.

Now, here is a chance of training your power of seeing. Examine the head carefully. What do you find?

You see a coil somewhat like a watch-spring. That is the trunk. If you examine it carefully you will find that it consists of two pieces which are nearly semicircular and which fit upon each other in such a way as to form a tube. Through this the butterfly sucks the honey.

But now I must tell you that he does not suck it as we do through a straw for the butterfly has no lungs through which he breathes. There are little muscles in the lower end of this trunk, which, as soon as some honey has risen in the tube, contract the tube at the point and thus drive the food up into the mouth. From the mouth

it passes into the stomach and intestines and there is digested, becoming a part of the body in a similar manner that food becomes a part of our body.

Now you will ask how the butterfly can live without lungs? Ah! but he has gills.

The butterfly has a similar apparatus.

Look underneath each wing and see if you cannot find a little hole. The hole is the opening of a stiff tube similar to our wind-pipe. There is one principal one under each wing but there are many more all over the body and even in the wings.

Here is a drawing that will give you some idea of the wind-pipes or *tracheæ* as they are called, and how scattered they are.

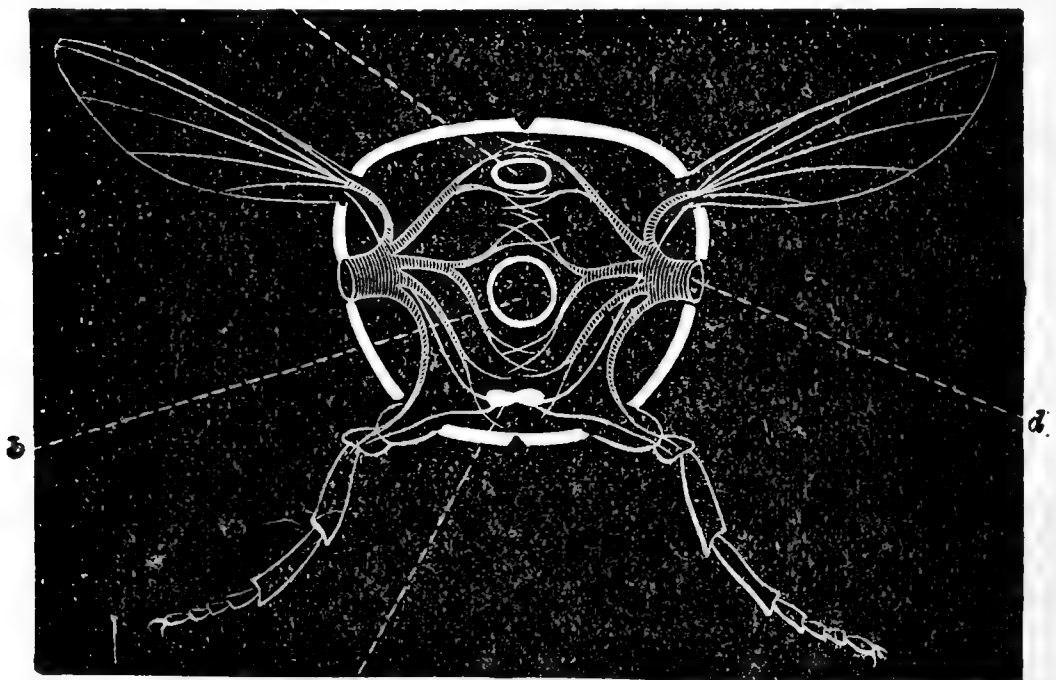


Fig. 4.

From Packard's "Guide to Study of Insects."

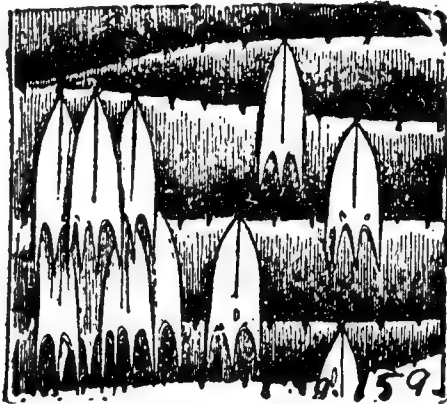
This, however, is the section of a bee. But there is not very much difference as to the *tracheæ*.

(a) is the nervous cord, (b) the intestine, (c) the heart, and (d) the *tracheæ*. Notice how the little tubes spread to all parts of the body.

Now examine the head again. You remember that I said the larvæ live on the leaves of plants, so, of course, they must have *mandibles* with which to bite the leaves.

Notice two horny little things on each side of the trunk. That is all that is left of the *mandibles* or pinchers as you would call them.

The butterfly does not need *mandibles*, because the food he eats is of such nature as does not require biting.

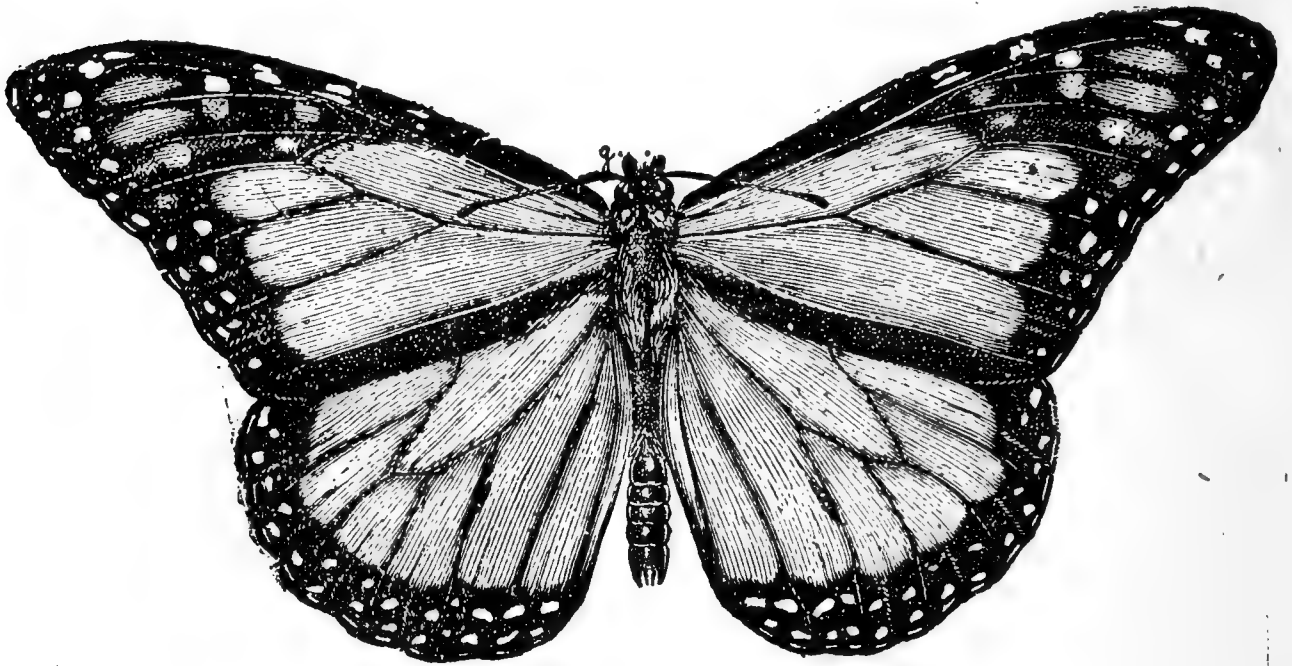


Scales Found on Wings of Butterflies and Moths.

From Eberhart's "Elements of Entomology."

Take the wings very lightly between the thumb and forefinger, rub them just a little, now look at them. Your fingers are covered with a kind of dust, are they not?

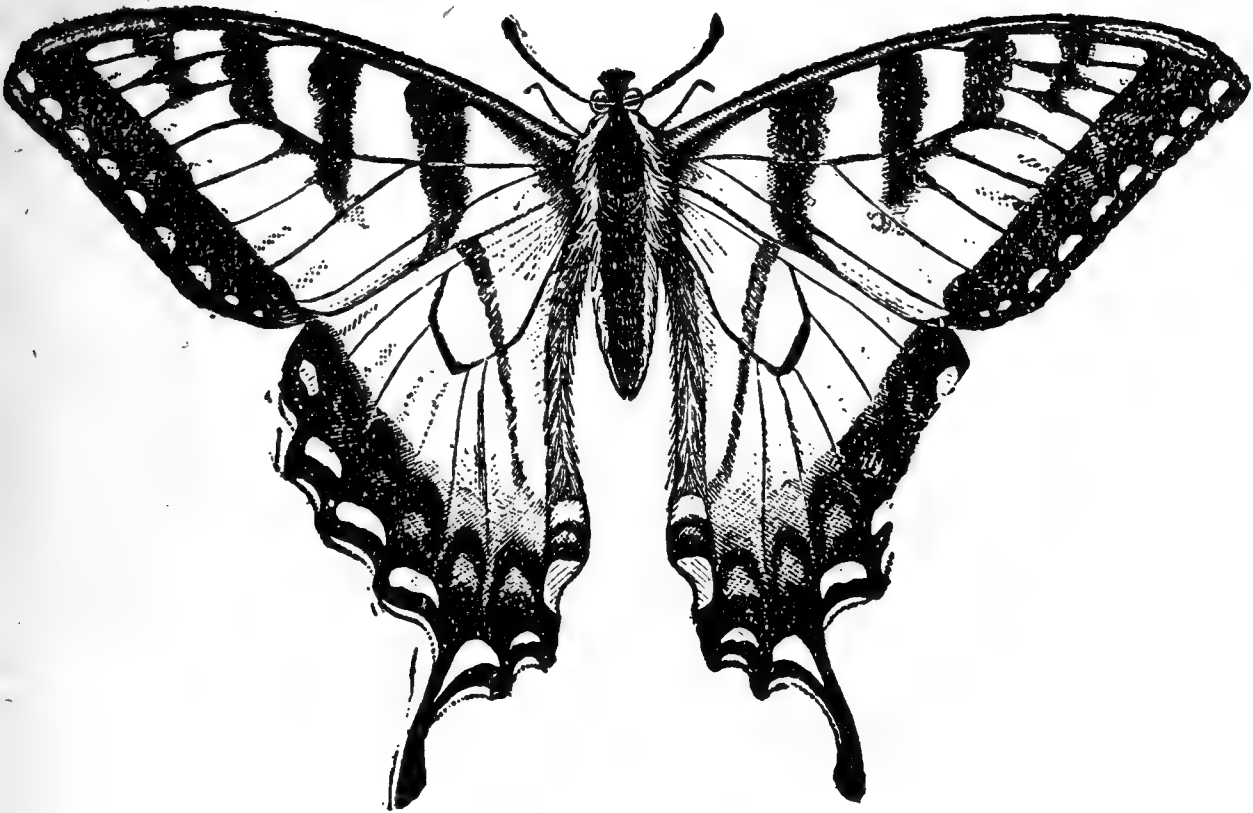
If you place some of this dust under a microscope you will find that it consists of little scales. From the fact that the wings are covered with these little scales, we call the butterflies and moths *Lepidoptera* which means scaly wings.



The Milk-Weed Butterfly (*Danais Archippus*.)
From Eberhart's "Elements of Entomology."



The Cabbage Butterfly (*Pieris Rapae*.)
From Eberhart's "Elements of Entomology."



The Swallow-Tailed Butterfly (*Papilio Turnus*).

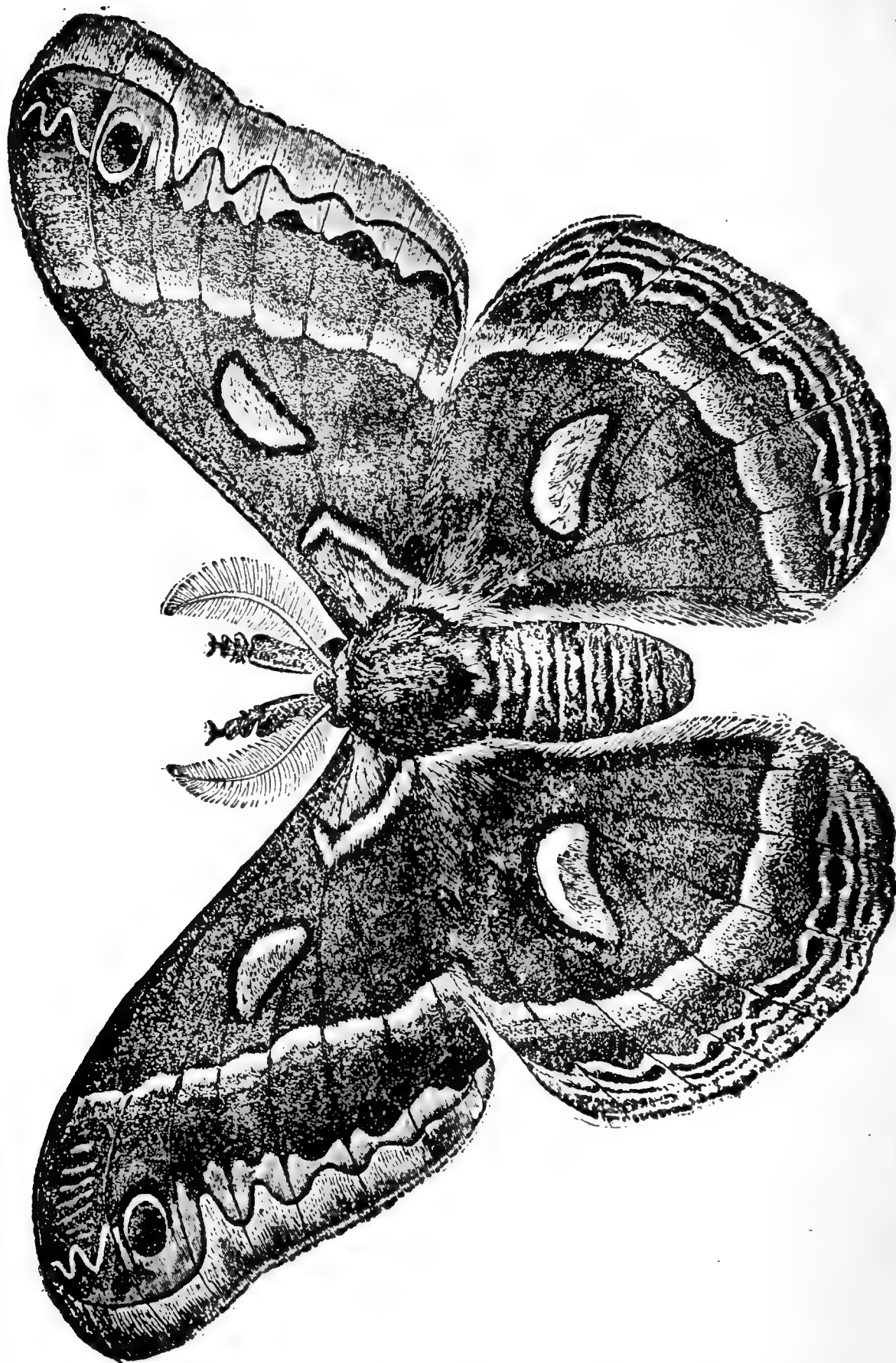
From Eberhart's "Elements of Entomology."

The butterfly that we have thus far examined, is the Cabbage butterfly. Above are given a few illustrations of the most familiar butterflies and moths.

I shall now tell you a little about a few very useful and hurtful moths.

(2.) THE MOTHS.

I have already told you that the distinguishing feature between the butterflies and moths is that the *antennæ* or feelers of the moths are not clubbed but tapering to a point and very often feathery, as you will see presently



Cecropia Moth. From "Eberhart's Elements of Entomology."

In order to see some good specimens we should wait until evening, when we may see such as the Death's-head moth, which has a figure like a death's-head on its back, and Owlet moth. But I have found some of the finest specimens also in the day-time.

There is one now, and it is a fine specimen too. Its name is *Attacus Cecropia* or *Platysamia Cecropia*. It is a kind of Silk-worm but its silk is of little use except to itself. A species of the same family, however, is cultivated, in California, for its silk, but the thread of the cocoon is not easily wound off because of the hole in it. The Chinese Silk-worm is cultivated more than any other.

Now, what is a cocoon? I shall tell you.

You remember what a larva is, do you not? And that the larva changes its skin a number of times. Now, before it changes its skin for the last time it weaves a silken thread about itself covering the whole body. This silken covering is a cocoon. The cocoon is made in the fall. During the whole winter and spring, for about eight or nine months, the pupa remains in this secluded place. In the month of May, sometimes earlier, the pupa excretes a kind of acid substance which dissolves the glue. The moth can then come out without tearing a thread.

This cocoon is one continuous thread which, by careful work, can be spun off and woven into silk.

Strange, is it not, that the most costly goods are not made by man but by animals. Of course, it takes our skill and labor to fashion these things but Nature herself is the prime manufacturer. Is not the manufacture of silk one of the greatest wonders of Nature?

This moth however is only one of the family of silk-producers. In China and western United States there is a silk-worm, called the Mulberry Silk-worm, the larvæ of which live on the leaves of the mulberry tree. These silk-worms are kept and raised in large quantities for their silk.

We'll now search for other moths. Let us go home from the clover-patch, perhaps the house has new curiosities.

In every house there is a kind of chamber in which old clothes, such as are not used any more, are laid or hung away. Let us go into this room and search for a tiny moth whose ravages are very destructive.

Ah! There is one. He came from that old coat in the corner. Let us look it over. Perhaps we can find a pupa. Ah! there is a pupa.

The moth is of a light buff color with silky wings. He has a thick covering of hair on his head. The wings are long and narrow with the most beautiful and long silken fringe which increases in length towards the base

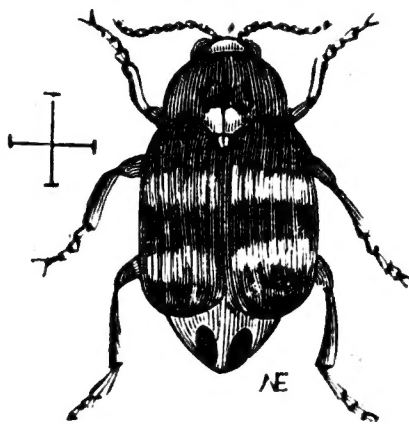
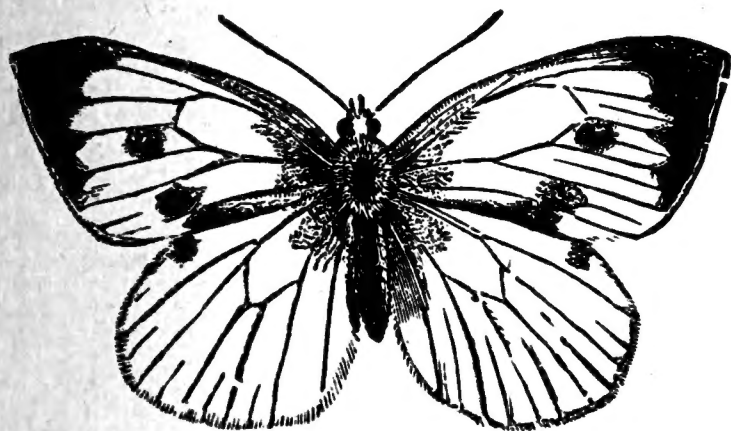
of the wing. At about May the moth begins to fly about. The eggs are generally laid in woolens, but sometimes you can find them in cottons.

Notice how flattened the case is in which the larva had its home so long ! This moth probably just came out of this case.

There are many, many other butterflies and moths about which I would like to tell you, and will at some future time.

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