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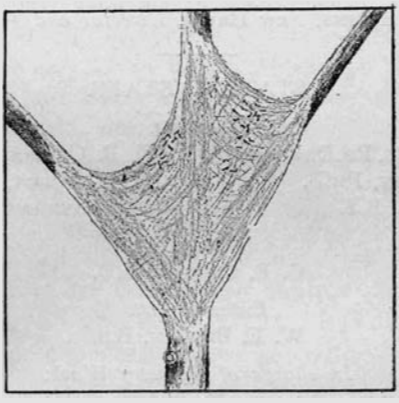
The Apple-Tree Tent-Caterpillar.



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THE APPLE-TREE TENT-CATERPILLAR.

Clisiocampa americana, Harris.

By W. E. Britton, *State Entomologist.*

One of the chief leaf-eating enemies of the apple orchard is the tent-caterpillar. Though not as injurious as some other pests, it is, perhaps, the most obvious one, for by it the trees are stripped of their foliage early in the season. As it forms conspicuous nests on the wild cherry and apple trees, its presence is evident to all, and as it may be easily destroyed there is really no excuse for allowing it to attack and seriously injure orchards. This insect is distinguished from others that feed upon the leaves by the nests or tents which it makes on the branches early in May. The caterpillars remain inside the nest through the night and during cloudy weather, coming out to feed for a short time each pleasant day.

Fruit growers are apt to confuse the tent-caterpillar with the fall web-worm, an insect which makes nests on the ends of the branches of fruit and forest trees during August and September. The two species are quite different and can easily be distinguished if we remember that the former occurs only in spring, and that the caterpillars stay inside the tent in bad weather, but go out of it to feed. The fall web-worm appears in late summer, and the feeding is done wholly within the nest. A few leaves are enclosed in the web, and after these have been eaten, the web is enlarged to include fresh leaves, which in turn are devoured. Sometimes an entire branch is thus enclosed by the nest of the fall web-worm.

The tent-caterpillar is sometimes wrongly called the "bag-worm." The bag-worm is a very different insect. Bag-worms do not live together in large nests like tent-caterpillars, but each larva forms a small bag or case from one to two inches long in which the body is enclosed. The entire larval period and the pupa stage are passed in this case and the female lays eggs in it for the following generation.

The apple-tree tent-caterpillar also differs from, though closely allied to, the forest tent-caterpillar, which has caused much injury to fruit, shade and forest trees in Vermont, New Hampshire and northern New York during the past few years.

Notwithstanding its name, the forest tent-caterpillar forms no tent.

The apple-tree tent-caterpillar is a native of North America and probably occurs throughout the United States and Canada, but is most abundant in the Eastern States. Though damage by this insect was recorded as early as 1646, the species was first named and described by Dr. T. W. Harris only fifty years ago.

Abundance in Connecticut in 1902.

Though the nests are seen every spring in Connecticut, the insect has not usually been as destructive here as in northern New England.

The wild cherry furnishes the common food supply, and often the injury does not extend to apple orchards.

The present season, however, the tent-caterpillar has been abundant everywhere and has attacked not only cherry and apple trees, but several other kinds. One grower reports this as the most troublesome pest on his peach trees. The black cherry trees and choke cherry bushes along roadsides and hedge rows were stripped of leaves. According to our observations, the outbreak was not a local one, but occurred over the whole State. It was somewhat more severe in the northern portion. The three agents employed by the Station to gather fruit statistics, who have covered the entire State in their travels, have reported defoliated trees in nearly every town. The writer has made similar observations in those portions of the State in which he has occasion to travel.

Moreover, of all orchard insects the tent-caterpillar is the most commonly reported by the fruit growers.

Mr. T. S. Gold believes that the insect has not been so abundant for sixty-six years or since the terrible ice storm of 1836.

Food Plants.

The black and choke cherry are the favorite and probably the natural food-plants of the species. The apple is the next choice, and in seasons when the caterpillars are numerous orchards are attacked and sometimes entirely defoliated. Lowe

mentions* cherry, apple, plum, peach, rose, witch hazel, beech, barberry, oak, willow and poplar as food plants. Weed found the caterpillars feeding upon birch,† and the writer has occasionally found them eating the leaves of various species of oak.

Habits and Life History.

The eggs are laid in cylindrical masses encircling small twigs of the apple and cherry, during the last days of June or first of July. Specimens in breeding cages in the laboratory laid eggs soon after the middle of June, but this is somewhat earlier than they are laid upon the trees out of doors. After depositing a ring of eggs averaging over two hundred in number, the parent moth covers the eggs with a viscid fluid which hardens, giving them a varnished appearance. The eggs are probably greatly protected by this coating from the weather and from predaceous insects. See Fig. I.

The eggs do not hatch until the following April, thus remaining upon the twigs for about nine months. The tiny caterpillars first feed upon the frothy mass surrounding the eggs, and next attack the new leaves which are then unfolding. After a few days they spin many silken threads to form their nest, usually in a fork of the branches.

This nest or colony contains the caterpillars from a single mass of eggs. Except when feeding they remain in the nest, but when nearly full-grown, the caterpillars may often be found at rest on the outside of the tent. (See Plate II.) They spin threads wherever they crawl along the branches from the nest to their feeding places.

The egg-masses do not all hatch at the same time, and it is not uncommon to find half-grown and newly-hatched caterpillars in the same vicinity. Mr. J. M. Whittlesey, of Morris, Conn., states in a letter to the writer, that during the spring of 1902, the hatching period extended over nearly twenty-one days.

The average feeding period is about six weeks, during which time the caterpillars have molted or cast their skins several times. As they increase in size they become more voracious and devour the leaves rapidly. At each molting period they

* Bulletin 152, N. Y. Agr. Exp. Station, p. 281.

† Bulletin 38, N. H. Agr. Exp. Station, p. 53.

stop feeding for a few hours, then begin again with renewed vigor.

When fully grown the caterpillars cease eating and wander about restlessly for a day or two, then spin white silken cocoons in the grass under the trees, in the crevices of the rough bark, or about buildings, boxes, etc., that may be near the infested trees.

There is only a single brood each year.

A colony of tent-caterpillars was brought into the laboratory on May 1st. The nest had been formed, though the caterpillars were small, measuring about three-sixteenths of an inch in length. They had probably been hatched about a week and are shown on Plate I. On May 26th, they had become full-grown and three or four were pupating. In a week all had made their cocoons and by the 16th of June the adults began to emerge. This continued for nearly a week, until all had come forth. Meantime several egg-masses had been formed in the breeding cage by the females.

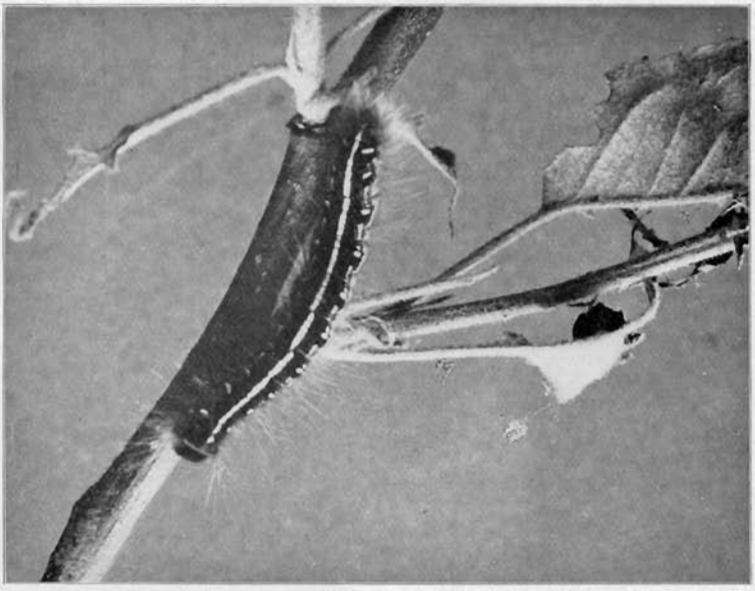
Description.

Egg. The eggs are grey in color and very small, being about one-eighteenth of an inch long, and slightly more than half as thick. The upper end is circular, and is slightly larger than the lower end. They are placed on end, close together, and covered one-sixteenth of an inch deep with a brown substance resembling glue. The whole mass usually encircles the twig, but is sometimes deposited on one side only. An egg-mass is shown in Fig. I.

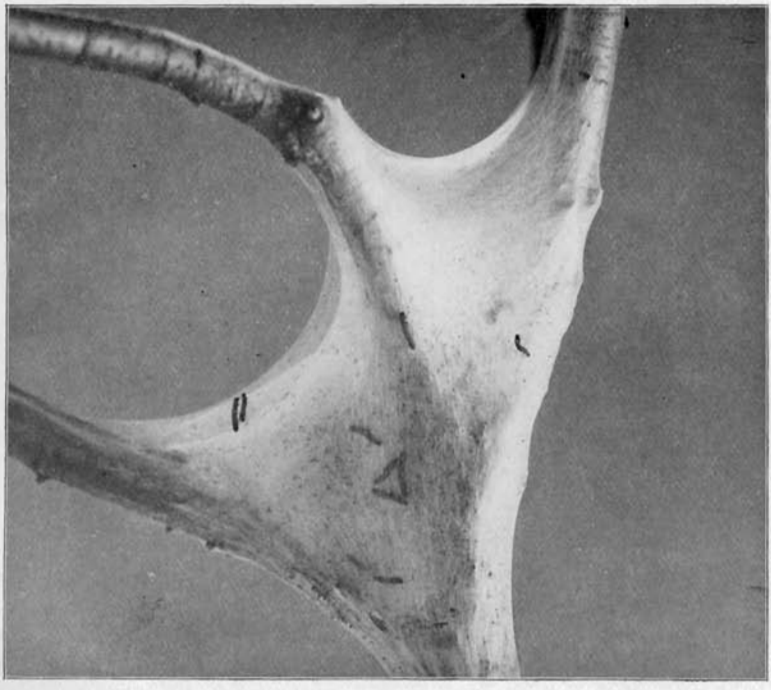
Larva. When first hatched, the caterpillar is very small and nearly black with a few grey hairs.

It molts five or six times as it increases in size, and after each molt the markings show more distinctly. When full-grown the caterpillar is from two to two and one-half inches in length and is thinly covered with long light-brown hairs.

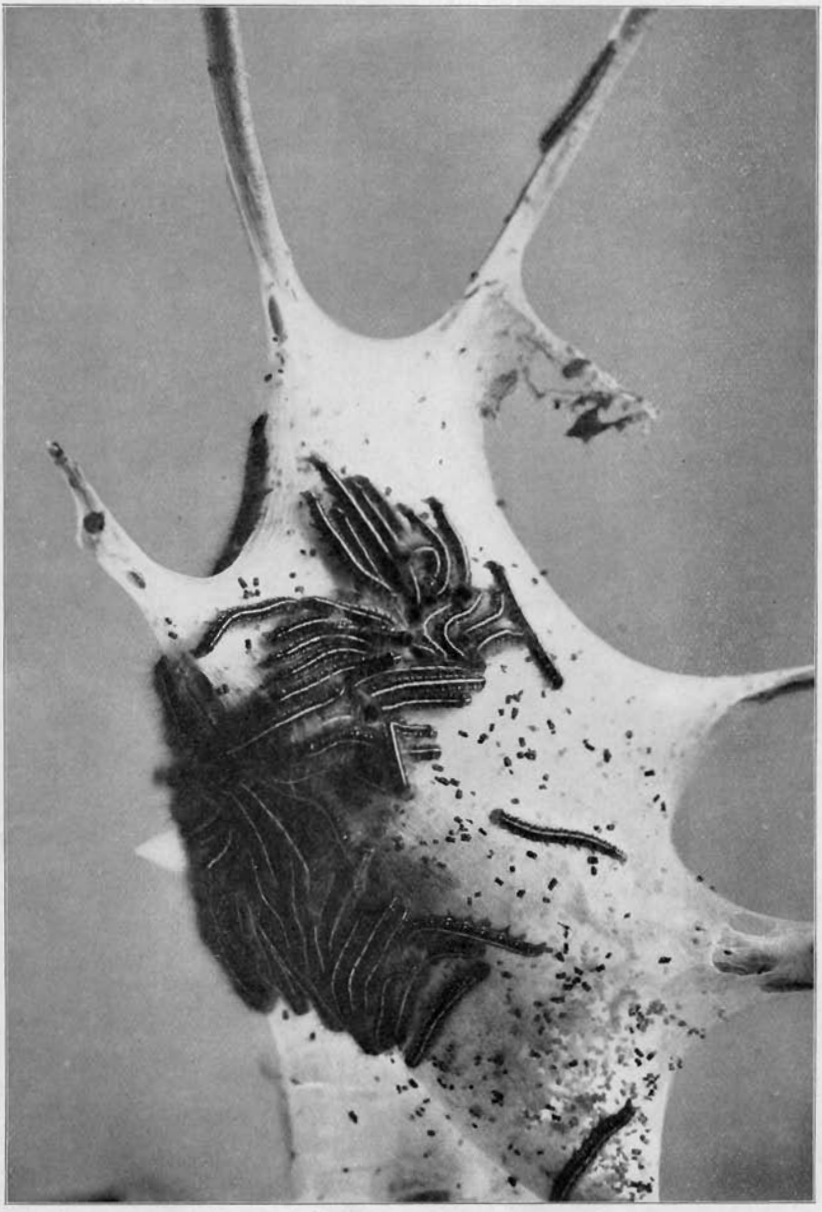
The color is black with a white stripe along the back, and many short irregular brownish stripes or markings along the side of each segment. The sides are of a bluish color and each segment bears an oval blue spot nearly surrounded with black. The under side of the body, head, and legs are black. A full-grown larva, natural size, is shown on Plate I.



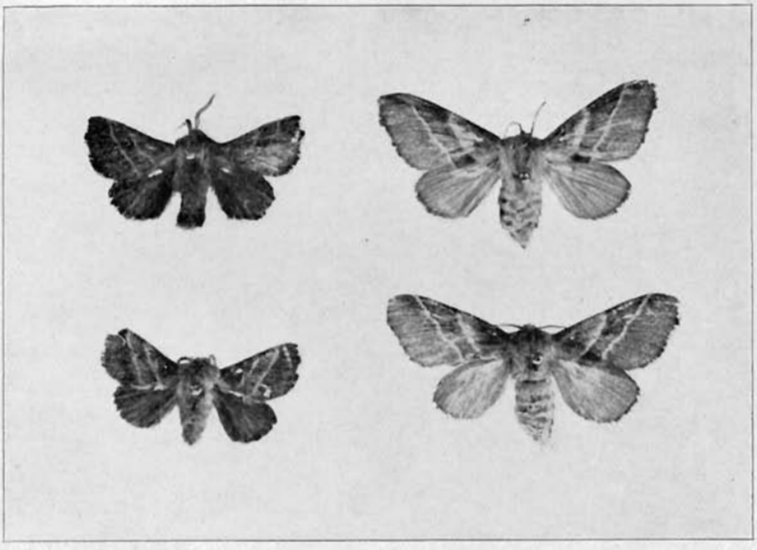
A full-grown Caterpillar. Natural size.
Photo. by B. H. Walden.



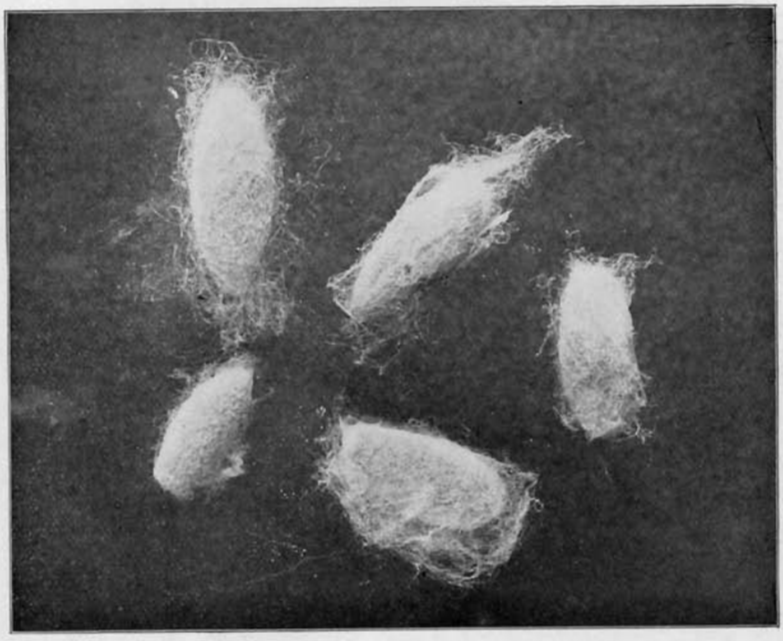
Young Caterpillars in nest.
Photo. by B. H. Walden.



Caterpillars resting on the outside of the nest.
Photo. by B. H. Walden.



Male and female moths. Natural size.
Photo. by B. H. Walden.



Cocoons of the Tent-Caterpillar. Natural size.
Photo. by B. H. Walden.

Pupa. The pupa stage is passed in a white, oval cocoon, which is about one inch in length and half an inch in thickness. It is made of silken threads spun by the caterpillar and loosely woven. It is usually attached by one side to some object in a more or less protected place. Plate III shows a few of the cocoons.

FIG. 1.—Egg-mass on Apple Twig; natural size.

Adult. The adult is a four-winged moth of light reddish-brown color with two whitish stripes, extending obliquely across each fore wing. The female has a wing expanse of about one and one-half, and the male about one and one-eighth inches. The males are inclined to be somewhat darker in color than the females, though there is much variation in the intensity of the ground color and of the markings in both sexes.

The rear wings are the same color as the fore wings, but are not marked with white stripes. Both sexes are shown on Plate III.

NATURAL ENEMIES.

The tent-caterpillar is usually held in check to a considerable extent by its natural enemies; in fact, but for them it would

be much more abundant and destructive each season. Its abundance the present season is due to a comparative scarcity of natural enemies, thus allowing the species to multiply unchecked.

An ichneumon fly, *Pimpla inquisitor* Say., is a common parasite of the tent-caterpillar, and there is a bacterial disease which in some seasons destroys the larvæ in large numbers. If the latter is prevalent, large numbers of dead caterpillars are found about the trees and nests.

Birds are important factors in the control of this pest, the cuckoos playing an important part. The crow, chickadee, oriole, chipping sparrow, yellow warbler, and red-eyed vireo are other birds that feed upon the caterpillars.

This season we have not observed the presence of the bacterial disease, or unusual abundance of the ichneumon parasites,—while the trees now have a great number of egg-masses, indicating that the insect will be abundant next season. Farmers and fruit growers should therefore be ready to combat it.

Remedies.

Destroying the Eggs.

Much can be done through the winter months in destroying the egg-masses. When the trees are bare these can be seen near the ends of the twigs, and may easily be clipped off by means of a tree pruner having a long handle, which enables the operator to reach and cut off the egg masses while standing upon the ground. These should then be gathered and burned.

Professor Weed recommends that children be given a small bounty for gathering egg-masses and cites a case in Newfields, N. H., where they were offered ten cents per hundred clusters, by the village improvement society. 8,250 egg masses were collected, and if each cluster contained 150 eggs, which is a small average, 1,237,500 eggs were destroyed at a cost of $8.25.*

Many writers advise the destruction of the wild cherry and

* Bulletin 17, New Series, Division of Entomology U. S. Department of Agriculture, p. 77.

seedling apple trees, which harbor the tent-caterpillar along the hedge-rows and roadsides.

If not destroyed, the owner should certainly care for these trees to the extent of keeping them free from insects, and not allow them to be a menace to his neighbor or the orchards of the vicinity.

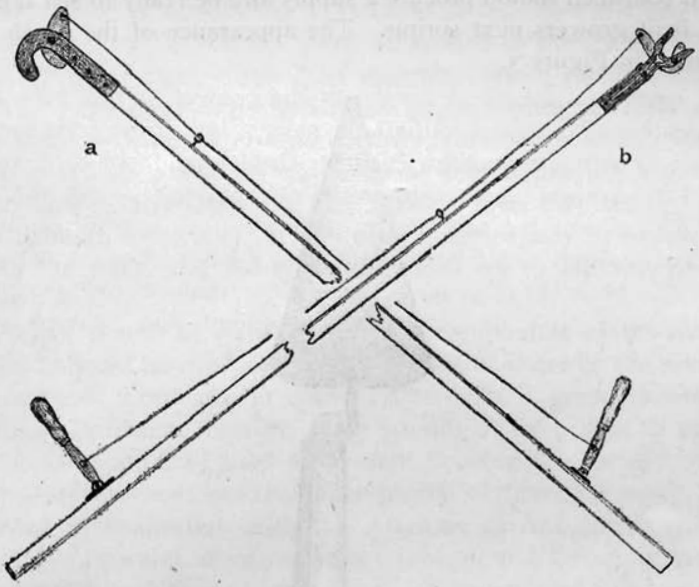


FIG. 2.—*a*, Waters' Tree Pruner; *b*, Henry's Tree Pruner.

Brushing off the Nests.

Twenty years ago the writer used to be sent through the orchards with a brush mounted on the end of a pole to remove the nests from the trees in the early morning or on a cloudy day when the caterpillars were in them.

The brush was made of stiff bristles twisted in heavy wire and trimmed to the shape of a cone about six inches long. It was made for the purpose, and worked admirably.

The operator stands upon the ground, inserts the point of the brush in the nest and gives it a few turns, and the entire nest with contents is wound upon the brush. The caterpillars may then be easily destroyed by crushing upon the ground.

During recent years I have not been able to find this brush on the market, but the M. Leiner Company of 1250 Brook avenue, New York, has been making some samples after my specifications and will be prepared to manufacture it in the future if there is a demand for it. The cost will be less than fifty cents at wholesale or even in dozen lots. Local dealers and seedsmen should procure a supply and be ready to sell them to fruit growers next spring. The appearance of the brush is shown in Figure 3.

FIG. 3.—A caterpillar brush.

Burning.

Some fruit growers practice burning the nests on the trees and for this purpose an asbestos torch has been designed and manufactured. The torch is filled or covered with kerosene, lighted, and held under the nest when the caterpillars are inside. We do not recommend burning, because there is danger of severe injury to the tree. Where the nests are near the ends of the branches the damage may be very slight, but as the tent-caterpillars often make their tent at the fork of comparatively large branches, it cannot be burned without danger of killing

these branches. Brushing off the nests with a caterpillar brush is just as expeditious as burning and there is no danger of injuring the trees.

Spraying.

Where the orchardist practices early spraying no other remedy need be considered. Arsenate of lead or Paris green, with or without Bordeaux mixture, applied to the foliage will kill the caterpillars. The chief difficulty lies in the fact that some of the caterpillars hatch and begin feeding as early as the first leaves appear and before there is really any leaf-surface to poison; some damage may be done before spraying begins. But, as the caterpillars eat very little at first, this damage is not liable to be serious. These early colonies may be brushed from the trees, and the spray depended on to kill the later ones.

A half pound of Paris green or three pounds of arsenate of lead should be used for each 50 gallons of water or the same quantity of Bordeaux mixture. Where Paris green is used without Bordeaux mixture, three pounds of fresh lime to one of poison should be used to prevent burning the leaves. As the Bordeaux mixture contains plenty of lime, no more is needed in connection with it. Arsenate of lead is perfectly insoluble in water, does not injure foliage, and therefore does not need the addition of lime. Paris green contains a little free acid which is soluble in water, and which unless neutralized may burn the foliage.

SUMMARY.

1. The apple-tree tent-caterpillar, a native insect and one of the chief leaf-eating enemies of the orchard, has been very abundant throughout Connecticut the present season and has injured fruit trees by defoliating them in May. Wild cherry is probably the natural food of the species, but when abundant it attacks apple and other fruit trees.

2. Eggs are laid on the twigs of the food plant in summer and hatch the following April. After a few days the young caterpillars form on the branches a nest in which they live, going out from it to feed. They are always within the nest

at night and in cloudy weather. They become full-grown in about six weeks and spin white silken cocoons from which the adults emerge two weeks later.

3. The small grey eggs are deposited in masses of 200 or more encircling the twigs, and are covered with a brownish substance. The full-grown caterpillar is over two inches long, black above and below, and blue on the sides, with a white stripe along the back. It is thinly covered with light brown hairs. The white cocoon is about one inch in length and half an inch in thickness. The adult is a reddish-brown moth with two whitish stripes extending obliquely across each fore wing.

4. The species is usually held in check by its natural enemies, which consist of several kinds of birds, parasitic insects and a bacterial disease.

5. The remedies are: to gather and destroy the egg-masses during the winter months; spray when the leaves appear, using three pounds of arsenate of lead or one-half pound of Paris green to 50 gallons of water or Bordeaux mixture; if impracticable to spray, brush off the nests as soon as they can be found, choosing the early morning or cloudy weather, when the caterpillars are inside the nest; burning the nests on the trees is not to be recommended.