SB 933
.R45
Copy 1

THE CONTROL OF TIMBER INSECTS, OF THE HEMILEUCA MOTH* AND THE PEAR THRIPS.

ight, 1915, by FRED REINLEIN, Colfax, California.

Circular No. 146.

August 10, 1915.

You read on page 10 of U. S. Agriculture Bulletin No. 170: "The fact that this species is stationary during the greater part of the year and only found within definite parts of certain kinds of trees, namely, in the next year's buds of pines, makes effective control work much easier than is the case with insect pests which are general feeders and which are not confined to definite parts of the foodplant, as for example, the gipsy moth or the browntail moth. While the European pine-shoot moth is confined to nurseries and private parks and has not spread to the native pines, it should prove a comparatively easy task to eradicate the species absolutely within any limited area. At the present time it would even seem possible completely to stamp out this dangerous pest in America * * *."

All idle talk.

The Bureau of Entomology has no effective means of control for general feeders on timber trees, by which evidently is meant defoliators in this case. Much less have they a means of control—effective or near effective—against the pine-shoot moth. Here is what Dr. Hopkins, in charge of forest insect investigations, is quoted as saying in Entomology Bulletin No. 58, page 86, on page 14 of my Circular No. 141: "defoliators * * * at present cannot be controlled by any known artificial means * * *."

As to talking about any possibility whatever of stamping out the pine-shoot moth, this, I shall show, if made in good faith, is absurd, or else a deliberate attempt to mislead the public.

Since I propose to show a means of controlling the gipsy moth when infesting medium-and low priced lands, let us first look at how

(*Hemileuca is the scientific name of the New Mexican Range Caterpillar.)

the attempt to stamp out the gipsymoth failed.

Farmers' Bulletin No. 275 treats on "The Gipsymoth and how to control it" and Farmers' Bulletin No. 264 treats on "The Brown-tail moth and how to control it."

On page 8 of No. 275 you are informed that the gipsymoth became a notorious pest in Medford, Mass., in 1889. The possibilities for injury were at once recognized by the State Entomologist, Dr. H. T. Fernald. As a consequence Medford began in 1889 a vigorous fight and the state appropriated \$50,000.00 in 1890. "Other appropriations followed with gradually increasing amounts and admirable work was done * * *. The last appropriation was expended in 1899 * * *." (p. 8) "at that time (1899) it seemed very probable to skilled, practical entomologists * * * that even extermination was possible in the course of a comparatively short time * * *." (p. 9.)

But to the taxpayers it did not seem at all probable. They merely saw the cold fact that in 10 years the moth had spread from Medford to over a territory of 359 square miles, so they stopped the work in 1900. This was going to the other extreme and was a mistake, too. "* * *but as far as extermination was concerned they might have stopped 10 years sooner. And here comes the proof of all, furnished by Chief Howard, too. ". . the egg masses are placed out of sight perhaps as often as in sight" (p. 14). Thus you cannot hope to exterminate the gipsymoth while in the egg stage. As to getting at the eggs, young and old caterpillars you find a lot of comment proving impossibility of extermination on pages 18 and 19, "* * * It is almost impossible to inspect the thick growth of underbrush for the various stages of the moth and there is no method for their treatment at a reasonable cost." The underbrush in this case was underbrush in parks, valuable city or suburban property. "* * * the young caterpillars begin immediately to feed, usually upon the lower surface of the leaves. As they * * * become larger they feed only at night, hiding during the daytime * * *." (p. 14).

The caterpillar pupates usually more or less hidden.

Of the adults, only the male flies. "It flies actively all day as well as by night." (p. 3.) It is attracted to light. The Bureau never advocated a means for reducing the number of the adults. Thus with

the insect spread by 1899 over 359 square miles of low priced land, the claim that there was a reasonable chance that it could be exterminated was a fake.

"With the creosoting of the eggs, the spraying against the young larvae, the burlaping against the old larvae, and with burning in places indicated (unimproved tracts of brush land and burning out the undergrowth in sparse woodlands) the insect may be kept in check." Of course this burning is bad from every point of view and under this regime would have to be repeated year after year as long as anything would grow at all. Even then " . . . the thorough use of these and other methods of destruction upon a large estate involves a great expenditure of money." The 'other methods' it is evidently left to you to find out.

A method I had pointed out as long as 11 years ago, aimed at the trapping of the males in large numbers, "* * * after mating the moths live but a short time and the female dies after depositing her eggs," (p. 13) "the body of the female is so heavy as to prevent flight." (p. 13).

The male clearly hunts for the female. Being attracted to light, an unknown and probably very large percentage of males could be trapped with a suitable trap as described in my Circular No. 145, pp. 3 and 4. This would result in many females being compelled to discharge their eggs when these are as yet sterile. This, in substance was with other matter for comparison pointed out on pages 10 to 15 of my Circular No. 141.

If a few femalemoths can be secured it might help matters greatly to suspend them in a small cage below the pail used to contain the males that are to be trapped.

Where an insect lays its eggs in masses as is the case with the gipsymoth, about 500 to the mass, the destruction of one such mass as a means of control is equal to the destruction of the larvae resulting from the 100 eggs laid singly into the buds of pines in the case of the pine-shoot moth. " . . . each one of these insects does very considerable damage, not only by destroying a large number of buds and young shoots but by injuring the adjoining shoots * * *. These injured shoots bend downward and outward and afterwards grow upward again in a curve. . . . Injury of this character is the result even when the species

is present only in small numbers, the repeated infestation of the leading twigs during several consecutive seasons producing additional malformations which result in a much distorted tree of little commercial value. If the pest becomes more abundant, then the trees are transformed by the effect of the injury into unsightly crippled bushes with no commercial value." (Bull. 170, p. 6).

"The species * * * has been the subject of much study and of an extensive literature from the time it was first described by Schiffermiller in 1776 to the present day" (p. 2). It also got a little study from me. The results were given to the Bureau, and those charged by law to look after the Bureau, in my Circular No. 145, pages 4 to 8 and consist, in substance, in showing the necessity of protecting the terminal bud against infestation in some way, one practical way being pointed out by pouring semi-liquid clay into the terminal cluster of buds at the beginning of the oviposition period. This would apply to all small trees, and to the more of the larger trees the more abundant the moths are. The moths by crippling the most of the rest of the shoots when plentiful naturally materially reduce development, and since they attack the larger trees when plentiful and these cannot be readily treated, they must be kept in check and a suitable trap as there described will do this work. Thus, of these two features of control, each serves quite a distinct purpose. Both are manifestly sound in principle, but the Bureau did not either admit or deny this.

My Circular No. 141 was written with the chief purpose of demonstrating to the Congressmen charged by law with looking after the Bureau the need of defining whether or not it is the Bureau's business to take action upon the evidence presented. These Congressmen, Senator Thomas P. Gore and Representative Asbury F. Lever, took no action. You find them remembered in the closing paragraph of my Circular No. 145.

Cutting off the infested twigs, allowing the topshoot to be infested first, is, of course, control only to the extent of finally getting a little brushwood for the big outlay. As to stamping out the pest, the Bureau, knowing the life history of the insect, knows there is not the slightest chance.

A female able to "swarm around the pines" each female

stocked to lay upwards of a hundred eggs and lay these eggs "singly on the new buds for next year's growth, the terminal cluster of buds being nearly always chosen for oviposition" means that it will go in search of upwards of a hundred terminal clusters of buds. The higher the tree the more difficult inspection, indeed, as near as can be seen only the smaller trees can be examined at all in a remedial way, but for extermination every shoot of any pine of any size for miles around would have to be examined, for there is no way to tell over how many miles the eggs were scattered.

Hence you see that if these forest insect control investigators are to be worth their salt, they have to investigate to the fullest extent the possibility of a torch, this the more as the majority of the other insects can be handled with it, and, in cases like the gipsy moth, by trapping the males, offers the only practical means of control on a large scale.

In this connection I wish to point out a chance for the profitable use of the torch on a number of insects, at times quite difficult of control.

The codling moth, where single brooded or with only a partial second brood, may be said to be easily controlled by an arsenical spray applied after the falling of the petals. But where there are two broods and over, the broods because of irregularity of emergence in the spring become usually pretty badly intermixed. Evidence at hand seems to show a poison spray applied when the second brood of worms begins to hatch will, while fresh, kill most of the worms then present, but the poison thus exposed loses its efficiency after a week or so while the hatching of worms keeps on, hence further sprays are usually necessary for effective control. If there be no apples or pears then, there is evidence to show that the moths would oviposit on softshelled walnuts and possibly on chestnuts, if available.

There are records that tend to show that the adults are apt to congregate upon some specially attractive food such as fallen, over-ripe sweet summer apples. As explained at length on pages 8 to 11 of my Circular No. 139, and briefly shown on page 9 of my Circular, No. 141, the codling moth is attracted to light such as is furnished by a torch used as a trap, hence a torchtrap set to work during favor-

able nights in such locations is likely to prove to be of much benefit. A closely related species infests the stonefruits, is smaller and has 3 generations where the codlingmoth has 2, hence is not readily amenable to any other treatment, at least after midsummer, than by use of a torch. Investigations would show that this holds good with several other important pests.

A traptorch is also likely to be of more or less use in the case of trapping day-flying moths that are difficult of control in other ways, such as the squash-vine borer and peach-tree borer; not that the torch could be operated as a trap during the day, but these moths are apt to be inclined to do some flying during warm nights even after it is dark enough for the torch to exert attraction. With the special attachments as described on pages 3 and 4 of my Circular No. 145 in use, there is no need for any kerosene and water in the pail; instead some canned squash, peach, apple or anything else suitable might be put in, and the sweetish smell produced, by the action of the heat blowing down upon it would go a long ways to attract insects that otherwise might not show much inclination to come to light.

Timber trees, moreover, are attacked by a large variety of other insects. The chief ones are considered, with means of control as the Bureau sees it, in Entomology Bulletin No. 58, Part V.

The most important, as there claimed, are the pine-destroying beetles. These fly in swarms and can most likely be trapped in vast numbers, as was explained on pages 14 and 15 of my Circular No. 139, and on pages 14 and 15 of No. 141.

The Bureau's way consists in girdling to hardwood some inferior trees. The dying condition makes them specially attractive for oviposition, when they are felled and barked, and the bark burned before adults can develop. In the report of the Entomologist for 1913-1914 you read on page 11 that "this is really an extraordinary discovery * *." But on page 20 of Bulletin No. 58 you read: "Among the most important features observed regarding the habit of this beetle was the fact that it is attracted to trees girdled by settlers and farmers in the process of clearing land * * *." Thus the farmers gave these entomologists the tip of what discovery there may be. Similar barkbeetles occur throughout continental Europe, but you never heard of their doing

great damage there, simply because each tree is watched, cut when becoming dangerously infested, and the bark is used up one way or the other within the proper time; all this without using any traptree; and this system is there in force since generations.

Next is mentioned the hickory bark beetle, probably attracted to light and could be trapped. Of defoliating insects that cannot be trapped there is mentioned on page 20 the pinebutterfly. The application of heat generated by a knapsack torch has the best chance of proving practicable during severe outbreaks in this and similar cases, since, possibly, the eggs may be largely within reach, or the caterpillars might crawl up and down the trunk and could be handled with a torch even during the night, or they might pupate at the base of the tree.

There is no satisfactory means of controlling insects injuring the wood of living trees. The adults are usually beetles and usually attracted to light and easily trapped. The Bureau's chief reliance is the cutting of the inferior trees and destroying as far as possible the insects within.

The white-pine weevil attacks the terminals of the saplings and young trees. These terminals could apparently be protected same as in the case of the pine-shoot moth, besides a trap run for other pests would be likely to keep their numbers effectively down.

Certain insects affect the cones and seeds of conifers. Agriculture Bulletin No. 95 treats on this point. It makes no attempt at suggesting control measures, and mentions especially several kinds of conebeetles, several kinds of moths, several kinds of seed chalcidid-wasps and a small gnat. If the torch be operated as a trap for other pests, the beetles and moths and the gnat could probably be effectively held in check.

Agriculture Bulletin No. 204 gives a "Report on the gipsymoth work in New England." After what has been already said, what is most important therein, is the claim that "The importance of bringing forest lands into a growth which is unfavorable to the development of the gipsymoth can not be too strongly urged, as the work of natural enemies is likely to fluctuate from year to year on account of adverse conditions or the decimation of the beneficial species by other parasitic forms * * *." (p. 32).

The report on pages 3 and 4 lays stress on the fact that "the forests of Germany are mostly coniferous and that "these are not injured by the gipsymoth," that the damage is nearly all borne by deciduous trees and that this was further borne out by evidence secured in that "* * * in Hungary large deciduous forests are present and the infestation is more or less common from year to year * * *." (p. 4).

Because of this it is now advocated to encourage the development of conifers to replace the oaks, birches and other deciduous timber trees that are susceptible to attack and which in the absence of cheap means of control, as the Bureau professes to see it, are doomed; first by direct attack by the gipsy and browntailmoths, and second by the attack by borers after they are once weakened, for "* * * spraying or treating gipsymoth eggclusters * * * is impracticable in most woodlands * * *." (p. 19). Why only in most woodlands is not explained. "* * * if there are present no trees or undergrowth upon which the young caterpillars will feed and thereby develop to a size which enables them to attack conifers" (after the first stage) "or similarly susceptible species, they will not be attacked * * *." (p. 21). But such trees and undergrowth—grass and weeds—is always present, if you hope to build up a young pine-forest and the trouble clearly is that the Bureau supposes that the pineforests of Germany were developed without giving attention to gipsymoth existence upon the mixed growth between the young trees. Just as every scrap of the tree is finally utilized there, so every young tree is watched and receives the required attention. The timber when finally sold is much higher there than in this country compared with the rate of wages paid for labor there, because much labor has to be infested in growing it, and this is everywhere shown by the greater use of stone and lesser use of wood as compared with American practice in building.

On plate XLVII of the Agriculture Yearbook for 1914 you see a "White pine plantations on old field in Connecticut, three years after planting," the young trees growing among a heavy stand of grass and weeds, all making first class feed for hatching gipsymoth caterpillars, and the little job the Bureau is up against is to show how they can keep this grass and weeds down and make the business pay. Besides with the pine-shoot moth now on hand, since the Bureau wants to pro-

fess there is no better way of control than removing the infested buds, you would get nothing but crippled bushes anyway under their plan.

It is the same with forage crops. Of these the New Mexico range caterpillar (hemileuca) is at present one of the most important problems.

It was shown on pages 21 to 24 of my Circular No. 139, and referred to on page 10 of my Circular No. 141, that the torch used as a trap at night is the most feasible means of control. The insect as egg, larva, pupa and moth is exposed to ready view, and another effective wholesale means of control would consist in the use of a multiple-burner, described on page 3 of my Circular No. 140, applied at the time the young worms are hatching.

Of the adults only the males have been known to be attracted to electric lights and windows, and these only under certain conditions (Ent. Bull. No. 85, p. 86), but this does not prove that a trap torch as described on pages 3 and 4 of my Circular No. 145 would not trap both males and females in enormous quantities, for, as a sample, the groundbeetles which constituted most of the 1,500 insects that made up my first catch, do not frequent electric lights and windows.

While these two different uses of a torch as a means of controlling the hemileuca are the only practicable artificial means known, there is another and much better means of control by way of utilizing natural enemies. This consists in the use of poultry.

The Bureau of Entomology is experimenting with parasites. Of course, parasites, with or without the aid of the Bureau, may gain the upperhand and in turn again lose it. The results, thus far, are trifling. On pages 86 to 93 of Entomology Bulletin No. 85, this matter is fully discussed as this matter stood in 1910. For instance, CHALCIS OVATA was found to have killed only 12 pupae out of 5,000 and PIMPLA SANGUINIPES infested only 9 pupae out of 5,000.

And how is it now, 5 years later. Well, under date of May 21, 1915, you read on page 10 of Agriculture Bulletin No. 204: “* * * and 1 colony” (of *Compsilura concinnata*, a gipsy moth parasite) “was forwarded to a substation of the Bureau of Entomology at Koehler, N. Mex., in order to test the value of this species as an enemy of the range caterpillar (*Hemileuca oliviae* Ckll), an insect which is causing enor-

mous damage to the grazing lands of that State.”

This parasite, a fly, when forced to breed upon hemileuca exclusively can produce little more than one brood a year.

On page 11 you read: “* * * 1700 specimens” (of *Calosoma sycophanta*, a predatory beetle feeding as beetle and larva upon caterpillars and pupae of the gipsymoth and browntailmoth, as well as on such native species as it may find (p. 7) “were collected by Mr. H. E. Smith and forwarded to Koehler, N. Mex., to test their value as an enemy of the range caterpillar.”

On page 93 of Bulletin No. 85 you read in regard to bird enemies of the hemileuca: “* * * A close watch was maintained on meadow-larks, blackbirds and several other species of birds, but none of these” (except robins) “was seen to attack or feed upon the caterpillars * * .”

These birds, including robins, it would thus seem will find the calosoma beetle and its hairless larva, obliged to work much in the open, a welcome addition to their menu and prevent any pronounced increase of this beetle.

Aside from this: “The jaws” (of the hemileuca) “are powerful, for their food is leathery and nearly juiceless, requiring a strong bite. Several times while in captivity the larvae have eaten quite a piece of heavy linen paper, their mandibles snipping through the firm edge of the sheet with an audible click.” Which makes it probable that if the calosoma, passing its first summer as larva, attempts to tackle the hemileuca, then present as caterpillar, it will not get old enough to eat any as beetle the year following.

But, what is a dead sure, and at the same time elastic and big-paying method of control is the systematic raising of poultry, and on a scale large enough to cope with the pest. With an area, at present, of about 50,000 square miles well infested, with the land low-priced, good for cattle raising only when free of hemileucas, and not good at all for cattleraising when thickly infested by them, you will realize that poultry must be raised in such numbers as to be able to keep the pest down.

This idea being new, you cannot overdo the raising of poultry, because if you had so many that there are not enough caterpillars on your place for them, you can always easily sell them in the open mar-

ket or to a man that needs them for this very work.

Since land rents at 3 to 5 cents an acre there, and when badly infested probably at less, and the meatscraps grow on the grasses and weeds the year around in the form of hemileuca eggs, larvae, pupae and moths, all within the easiest possible picking, usually on vegetation below 12 inches in height, and a large part of the needed grain-food furnished by grass and weedseeds, it is worth your while to figure whether or not it will be possible to raise on these lands poultry at a cost far less than can possibly be done most anywhere else. But even if it did not pay—if this chickenraising had to be carried on at a moderate loss, it would pay indirectly as a necessary remedy by keeping the land fit for cattleraising.

It might be argued that these lands are too far removed from the markets and that there would be a particular difficulty in getting the eggs to market, and other objections might be raised. None of these objections are tenable.

With such a large territory to be kept clean, with the ranch on the average, say, 35 miles removed from a shipping point, all you have to do for quick transportation is to keep an auto truck line in operation over a given stretch, tapping shipping points at the two ends. This would make it possible to ship eggs daily or at least 3 or 2 times a week. The ranches least accessible to such auto-roads could buy up the cockerels in the spring, caponize them and raise poultry for meat only.

We will consider the exclusive raising of male birds first. You have the meatscraps growing on the grasses and weeds, and you have most of the seeds on the grasses and weeds, all scattered over the big ranch, but you have no water handy, no shade, no protection against 2 and 4-legged chicken thieves at night. And you want to keep your flock always together.

You might construct a lightly built 8x8 house, or one even some smaller, or merely a tent stretched over a frame work of these dimensions, built upon runners, well raised to glide over the grass and weeds, or built upon wheels. This would give you a place to carry your water and grain and other needed supplies and provide a bunk for the attendant. For shade you can have wide canvas flaps at-

tached to the 4 sides of the building; these would give plenty of shade merely by tying the ends to some stick driven in the ground.

For protection during the night, or night and day in case it is necessary or desirable, have a woven wire fence 5 or 6 feet high of suitable mesh. A few light gas pipe stakes driven in the ground will hold it. Or short, heavier pieces, capable to receive this pipe could be driven by use of a suitable cap. This outfit is to be moved from place to place upon the ranch, say, once a day. This would require an attendant, one or two horses, and it would pay to have one or more trained dogs.

Taking an 8x8 building a fence of only 63 feet in length will provide an enclosure around it with a diameter of 20 feet and with the center of the building taken as the center for the fence line will give a clearance of over 4 feet between each corner of house and fence. There would then be no suitable place for the horses inside the enclosure at night.

If this same circle be moved 3 feet closer to one of the sides, this will give a corresponding increase of space on the opposite side, in this case 10 feet as the greatest distance, and this allows space enough for the horses. A circumference of 75 feet would add but very little to the weight and be much roomier.

8, 12 or 16 gaspipes, according to what animals have to be kept out, would stiffen the fence and these pipes driven into place in the morning will provide fastening points for the awning ends. For roosting places some collapsible racks similar to those used for drying clothes placed under the awnings would be about right; or anything else that will do for that matter. With thus everything nicely cooped up at night, it is safe firing at anything nosing around outside.

With a dependence for water at the building, with shade only there, and with grain fed only there, if necessary only in the evening, and with protection during the night to be had only there, it ought to be possible to make sure to have every chicken come home to roost.

And for all the rest this chicken-raising does not differ from any other.

With an outfit run for eggs the arrangement is to be in substance the same except that there must be plenty of room for nests.

This would presuppose a better and larger building, so arranged as to allow of a large number of nests.

Wire-nests hooked to some framework are probably best, as then from time to time the contents could be emptied and burned. Possibly such or similar nests could be hooked also on the outside and made to work there by fastening a piece of canvas so as to drop in front of each nest, thus providing the desired seclusion.

It might be argued that the spines of the caterpillars have an irritating effect especially when these caterpillars are nearly grown and that this would interfere with the wellbeing of the flock and with its work of keeping the hemileuca in check. Since the smaller larvae, and probably also some medium to large ones, are known to be eaten by robins (Compare Ent. Bull. No. 85, p. 93), poultry ought to stand them of any size. By the time the most advanced larvae begin to pupate, there are still many larvae only partly grown and of which they can eat in abundance, with impunity, while later there will be plenty of pupae and these are spineless.

The conditions outlined ought to be exceedingly favorable for turkey raising, and these are even more likely to be immune against the spines of the full grown caterpillars.

If there then be anything missing to make scientific chicken-raising possible I want to be shown.

The product—meat and eggs—should under these conditions be of the finest. The commercial meatscrap is carrion and there are people that claim that many an epidemic has been started through eggs produced by hens fed on such meatscraps.

As long as this new industry has not grown to big proportions, considering the high quality it ought to be possible for the ranchers to work up and supply a private demand and as the business will rapidly develop, the thing to do is to think about forming a Poultry and Eggs Shippers' Association just as soon as practical results warrant. How many chickens could thus be raised per acre you may ask. That, of course, would depend when you start and the abundance of the pest. If you have a thousand cockerels at hand when the worms hatch, they will, of course, clean many more out than if these worms had been allowed to grow. If you have a large range full of worms by August

15 of this year, the best thing to do would be to buy a carload of young poultry and set them to work along the lines shown and you will have 2 carloads to ship by October, or November.

On page 10 of his report for 1913-14 the Entomologist, after stating what the Bureau is doing with parasites and predaceous enemies to keep down the hemileuca, he finishes by saying: "An assistant of the Bureau of Biological Survey, detailed to study the vertebrate enemies of the caterpillar found that skunks destroy myriads of the pupae."

The inference, then, is that they refuse to eat the eggs, larvae and moths, for these latter rest during the day on the higher parts of the grasses and weeds in plain sight and easiest reach. Then as these skunks live for the rest of the year on other things, it is safe to say that a skunk that is known to have failed to clean out a birdnest when he had a chance is not in good standing with skunkdom. They thus then do about as much to increase the pest as they do to keep it down. Anyway, poultry eats the hemileuca in all its stages, thus is far the better kind of vertebrate enemy. Hence when the skunks come to look at the chickens at night, the thing to do is to carry on a little skunkfarming, simply by shooting them.

Carrying a fence along for the night might seem burdensome. This fence makes it possible to take care of all comers, big or small. A few lambs newly separated from the rest of the flock might be purposely enclosed to attract bigger game by their bleating. The fence might then prove to be not a real protection, but it would delay attack and render actual attack more difficult. With dogs to watch, and the house a safe place to shoot from, you can tackle the biggest thing than can come. You then thus not merely protect the chickens, but clear the country of roving beasts of prey, and thus protect the larger stock.

As for roosts, with the location ever new, there is no real need for them. Of course, only a limited number of birds would be wintered over, and these, with ground changed often, will winter better by being induced to huddle together on the ground under cover of canvas.

Manifestly, this plan of control is the one to adopt, since it makes use of the pest with the final object of contributing to the sustenance of mankind.

You will readily see that for all-around best results this knowledge should be placed before the public without delay. But since my experience with the Department of Agriculture for 17 years past has shown me that they do not want to look at it this way—if such knowledge comes from an outsider—and since the Congressmen charged with looking after these things do not want to do a thing, there is no other way for the present but to sell this knowledge to the man willing to hand over the required sheckels, irrespective of how much or how little land he may control.

A strong effort was made in my Circular No. 144 to show how the country is the loser by the Bureau declining to define what merit there is or is not to a means of control original with a mere citizen, by showing where this course leads to in the case of the pearthrips. Now comes Agriculture Bulletin No. 173 and throws a lot of light on two essential points: first, it shows a range of foodplants much larger than before known, and, second, it gives the record of formidable swarms as far back as 1910.

“While the pearthrips is distinctly a deciduous fruit insect and practically all of its damage is confined to this class of plants, it has been found upon a great variety of plants, the list of which is increasing each year” (p. 11). The list now includes poisonoak, mustard, liveoak, miner’s lettuce and various grasses and weeds.

Since there as yet always was plenty of chance to migrate in California, singly or in swarms of size not attracting attention, to uninfested territory, you can expect some trouble when they become crowded all around.

This is made clear by records of “reports stating that the pearthrips were flying in swarms * * .” (p. 36). On the same page the junior author records having on the afternoon of March 28, 1910, “had great difficulty in keeping both hands on the reins on account of the great numbers of thrips, which, flying through the air, filled his eyes and covered his clothes * * .” Then he goes on to record a case of a Mr. E. L. Fellows leaving Santa Clara on March 30, 1910, about 5:00 o’clock. On the way, by 5:15 p. m., he touched upon a swarm of thrips. “* * *the thickest part of the swarm * * * appeared literally like a black, glistening seething mass moving up and down like heatwaves . . .

He thought the swarm to be about 8 miles long and 4 miles wide, from 4 to 15 feet high * * *. This same swarm was noticed by the junior author and by several fruitgrowers * * *." (p. 37.)

That simply shows what an excess of numbers had developed in a certain locality, this in spite of orchard spraying of the brand dished up by the Bureau. The use of heat would make control practicable in lots inaccessible to the much heavier spraying machinery, besides costing very much less and capable of being used during a much longer period—all the time while the thrips are above ground.

But there appears to be good reason to believe that this thrip could be attracted to a traptorch and thus be held down at trifling cost. And since the thrips has now become well established East of the Rocky Mountains, the fruitgrowers there had best take notice.

Although it is not essential for success that the above type of torch be used, yet its compactness facilitates the work and thus makes it especially desirable. The construction of this type involves a good deal more care than is required for types where the pump is located outside. They are

obtainable through me, supplied with attachments for trapping the adults desired in large numbers, for \$10.00 each, guaranteed to be in perfect working order, and they are delivered chargees paid, together with full instructions of how to get the maximum benefit out of them.