An examination of the pieces of shell in the vial at that time resulted in my finding fifty-six living larvae. Some of these were quite small, measuring but 2.5 mm. in length (exclusive of the terminal brush), and had possibly been overlooked in some of my previous examinations. The largest larva measured 6 mm. in length, exclusive of the brush. About fifteen cast skins were found at this time.

On March 30th I noticed the first adult of this brood in the vial, and upon making an examination of the pieces of shell I found fifty-four living larvae, one of which was about to pupate. In addition, there were four living larvae in the cork and about thirty-five cast skins mixed with the excrement and dust at the bottom of the vial.

In time I expect that all, or practically all, of these fifty-seven larvae will reach maturity and pupate, with nothing but their present food supply to subsist upon; for it is very evident that they can maintain themselves on these rations.

*T. tarsale* in the larval state, has been recorded* as feeding upon a variety of substances, among which may be mentioned the following: Flaxseed, castor beans, Cayenne pepper, peanut meal, wheat, etc., but as far as I am aware it has never been reported as being able to subsist and reach maturity upon such scant rations as dry hickory nutshells.

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**FILLING THE CALYX CUP**

A. L. Melander, Pullman, Wash.

A year ago Dr. E. D. Ball presented before the nineteenth meeting of the Association of Economic Entomologists a most valuable paper on spraying for the codling moth (Bull. 67 U. S. Bureau of Entomology). His work had led him to believe that spraying for the first brood could be so effectively done as to render later sprayings unnecessary.

The keynote of this treatment is that as the majority of larvae, both early and late, enter the calyx cup, that part of the apple needs poison more than any other part of the tree. To place poison below the stamens requires a high pressure of 100 to 200 pounds, a coarse driving spray, and the spray must be rained down on the flowers until the tree is drenched. Arsenate of lead must be used, but it need not be stronger than one pound to fifty gallons. A mist spray will not penetrate into the lower cup, nor will a coarse spray shot directly into the tree to fall by gravity into the upturned flowers. When the lower calyx cup is full there is enough spray on the foliage and fruit


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to poison practically all first brood larvae that fail to reach the lower cavity. There can then be no late larvae, and consequently apples escape late blemishing stings, as well as the chance of becoming wormy through late ineffective sprayings.

Although this method of treatment has proved not only practicable but better than any other method in the Pacific Northwest, in many districts of Colorado, Utah, Idaho, Washington, and California, there are many Eastern entomologists who firmly believe that it is inapplicable to the conditions east of the Rocky Mountains.

In the discussion of Dr. Ball's paper, as recorded in Bulletin 67 of the Bureau of Entomology, "Mr. Fletcher pointed out the desirability of not casting any doubt on the efficiency of methods now generally in vogue for controlling this insect. In Canada 70% of the apple crop is saved by the present acknowledgedly imperfect spraying methods. He did not believe it necessary to lay so much stress on filling the calyx, and was decidedly in favor of delivering the spray in as mistlike condition as possible. Excellent paying results were now being secured by ordinary farmers with the mist spray which has been used for several years.'" The contention is that if we can save 70% there is no use in trying for 100%.

"Mr. Quaintance pointed out that fruit-growing conditions in the Mississippi Valley and Eastern States were quite different from many sections of the West, such as Utah. The absence of rains there during the growing season largely obviated the necessity of fungicides. While he did not doubt that it was entirely practicable to use a coarse spray for the codling moth in Utah and thoroughly drench the trees, this would be a bad practice according to present ideas of spraying in the East, where a mist-like spray is desired to treat uniformly all parts of the foliage and fruit. Under present conditions of spraying, young apples are often russeted by the Bordeaux and arsenical treatment, especially by the one just after the petals have fallen, and a thorough drenching of the trees at this time would be likely to prove harmful in this way.'" Of course, it is harmful and expensive to drench the trees with Bordeaux mixture, and the conservative fruit grower feels that to apply the two mixtures separately is more trouble than the fruit crop is worth.

The editor of the Fruit Grower of St. Joseph, Missouri, in commenting on our methods of spraying in the January issue of that paper, thought it necessary to add that "Professor Melander's experiments were conducted in an irrigated country and therefore rains did not wash any of the poison from the foliage nor from the young fruit." It should be unnecessary to remind him and many others
that it rains in Washington as well as elsewhere. In fact, after the second spraying one year in the Yakima Valley three inches of rain fell in a few hours, yet where arsenate of lead was used there was no need of re-applying the spray. Last year we gave the first spraying of one orchard at Walla Walla in a hard wind and rain, yet with the same perfect results as elsewhere, for our spray at 200 pounds pressure penetrated below the stamens, while the rain did not.

Since 1901 the Illinois Experiment Station has been comparing high and low pressures and misty and coarse sprays in treating the codling moth. They conclude that "the application which was most effective in filling the calyx cavity was that made in the form of a fine mist by means of a Vermorel nozzle under high pressure." (Ill. Bull. 114, p. 383, 1907.) That may be true when it applies only to the outer calyx cavity, where the larvae do not enter the apple. The fourth year of this experiment a pressure gauge was secured for the pump, when it was discovered that the "high pressure was probably about eighty pounds."

Even so recent and authoritative a paper as Farmers’ Bulletin 247 (1906), obviously written from office experience rather than acquaintance with field conditions, ignores arsenate of lead, advises a fine mist spray always, and suggests six sprayings for the codling moth. And yet when a Western Experiment Station asked for an Adam’s fund project on the codling moth we are assured by the Office of Experiment Stations that the Bureau of Entomology advises "that the codling moth problem is solved."

Dr. Ball’s paper evidently aroused interest at the New York meeting, for we now find in the second number of the new Journal of Economic Entomology a summary of an extended statistical experiment on the value of early sprayings in New Hampshire. This project was undertaken by Director E. D. Sanderson, and was an attempt to apply Western methods to Eastern conditions.

"Plot 1 was given the spraying immediately after the petals fell, with a fine mist. Plot 2 was sprayed at the same time with a Bordeaux nozzle and thoroughly drenched, the spray being applied at 100 pounds pressure. Neither of the plots were sprayed subsequently. This experiment was repeated under similar conditions in another orchard. There was but 2% or 3% difference in the results in both cases, in one orchard favoring the drenching and in the other favoring the mist, so that we are forced to the conclusion that there is very little difference in their effectiveness." Considering the total benefits for the season, it was found that spraying the calyx only may give a benefit of 62%,” which is surprisingly low compared with Western results. The explanation, however, is clear
when we read that "careful examination of the calices by Dr. Headlee failed to show any spray lodged beneath the stamens or in the calyx cavity proper." An attempt was made to apply Western methods to Eastern conditions, that is to fill the lower calyx cup with poison as the best treatment for the codling moth, but the most essential point was neglected,—the spray was not shot down and was not put in the only place where it was needed.

All of which reminds me of the early troubles in the East over the sulphur-lime wash; how the impractical spraying of a couple of entomologists induced a neglect of a tried remedy, known to be completely effective on the Pacific coast, with a consequent ruin of millions of dollars of orchard property. Since, "in a second bulletin from the U. S. Department of Agriculture, the chemical reactions of the wash were set forth and it was shown almost conclusively that sulphur-lime could not reasonably be expected to be of much value in the moist East" (Bull. 37, p. 55, U. S. Bureau of Entomology). This neglect might have continued until today had not Dr. Forbes' experiment of washing off the spray with a pump and yet finding the scale dead, or the successes of a few practical fruit growers awakened official entomologists to the fact that something was wrong. This neglect of the sulphur-lime wash in the East has had an important economic bearing, since probably as much as any one factor it has been responsible for the transfer of interest in fruit growing from the East to the West.

Now, the purpose of this paper is not to antagonize Eastern entomologists, but to call attention to the fact that a most important field is still open for investigation. The success of careful filling of the calyx cup has been too universal in the far West to believe it is inapplicable elsewhere. If some Eastern entomologist will actually spray as we do in this region and give our methods the trial they deserve, the sole purpose of this article will have been accomplished. But an apathy to successful methods if continued will be detrimental to the profession of economic entomology, especially when the insects concerned are as prominent as the San José scale and the codling moth.

REPORT OF THE SIXTH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF HORTICULTURAL INSPECTORS

The sixth annual meeting of this association was held at the Windsor-Clifton Hotel, Chicago, Ill., December 27, 1907. Mr. A. F. Burgess, Washington, D. C., presided and Prof. James Troop, La-