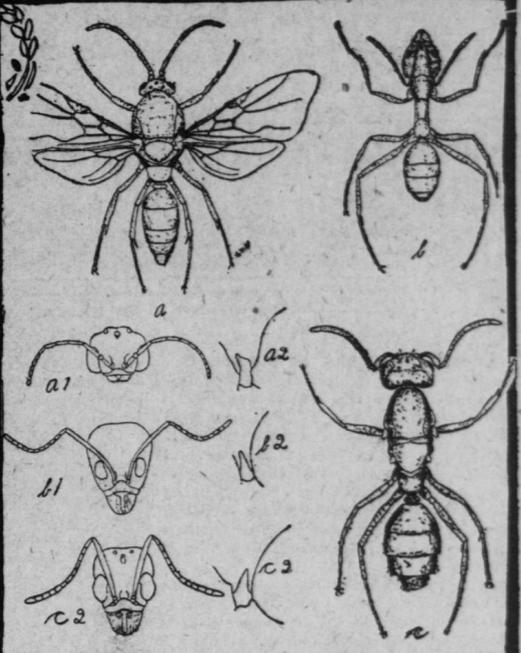


Checking EAST OAKLAND'S PLAGUE OF ARGENTINE ANTS



A COLONY OF ARGENTINE ANTS IN THEIR FORMICARIUM



THE ARGENTINE ANT. a - ADULT MALE. b - head of worker. c - head of queen. ENLARGED

By R. R. Broughton

AN ANT that works its way through walls, walks with ease on water, slides down a wire, strolls into the baby's mouth, eats kittens, protects all fruit lice and kills its enemies, destroys orchards, and, in time, renders life in a community not only profitless, but intolerable, has come to California with the intention of staying. And as it has stayed everywhere else it ever visited there would be every reason to believe that it would within a few years take complete possession of the state, do away with fruit, especially oranges, and render pale and sickening the brilliant flowers and make of this lovely country but a feeble imitation of itself, were it not for the fact that a young man working in a quiet, prosaic garden in East Oakland has solved the problem of its destruction.

This ant is from the tropics, but it has none of the easy going ways accredited to that clime. It is beyond all comparison the busiest little ant there ever was and would serve to point the favorite analogy. Moreover, it supports the analogy, which modern nature observers would discredit, by working with a definite purpose. As an empire builder humanity offers no parallel. It drives out all other ants before it and takes entire possession of the field. It increases at an unbelievable rate—an ordinary garden producing perhaps 100,000,000 in a summer. If left alone it will eat you out of house and home, and it is next to impossible to keep groceries out of its reach. As a house pest alone it is almost unconquerable. The first scientist who made note of it discovered it in Argentina, but it is even more common in Brazil, and it is from that country that it migrated to America. It was met in this country for the first time on the wharves of New Orleans, having traveled from Rio Janeiro on coffee ships. That was in 1892. Nothing was done about it there until very recently, and in 17 years it has spread over 5,000 square miles in Louisiana, completely destroying the orange trees and stopping the large and flourishing cut flower industry.

Somewhat a colony was shipped in a bale of cotton from New Orleans to the plant of a cotton works at the foot of Twenty-second avenue in East Oakland about eight years ago. They immediately migrated farther, according to their restless habit, and now they have established themselves in the whole section lying between Lake Merritt and

Fruitvale, from the estuary to the hills. During the unmoisted years they have also secured free trips to Alameda, San Francisco, Stockton, San Jose, Los Angeles, Ontario, Riverside and other southern California points.

Until last summer California was ignorant of the menace. The communities affected had complained ineffectually of the bother of keeping away the ants, but it was not until J. C. Bradley, an entomologist connected with the University of California, gathered a few specimens and, not being able to classify them, sent the specimens to Prof. W. M. Wheeler of the American museum of natural history that the awful truth was known.

Argentine ant! It sounds portentous, and it is.

Prof. C. W. Woodworth of the college of agriculture, hearing the unpleasant news, lost no time. He made a trip to New Orleans to learn what had been done there and returned immediately to establish an experiment station in the midst of the largest colony in California, that in East Oakland. Last October he rented a house at 1183 East Twenty-second street, fitted it out with the proper apparatus, and placed assistants in charge. Little, however, could be done in the fall, as the ants were hibernating for the winter.

Last February L. H. Day, formerly entomologist for San Benito county, was placed in charge of the active work by Professor Woodworth and, after months spent in studying the life habits and experimenting with poison, he has succeeded in reducing them to a few per cent of their former numbers wherever he has worked.

His remedy is simple, easy to use and not dangerous to children, animals, birds or bees. He fills a sponge with syrup, places it in a small fruit jar, screws on the top, making a few holes in it with a nail, and sets the contrivance in the garden.

The ants, always in search of food, soon find it, and the word is passed to all the ant colonies within several hundred feet. After they have fed off the sponge for several days and a hundred million ants or so are receiving some part of their nourishment from it, he puts poison in the syrup. By this time the lines of ants from the different nests are well established and they carry away the poison to their queens. Within a few days the nests are filled with the dead.

Day had just come to the conclusion that he had solved the problem, but had a few points yet to cover when I visited him at the experiment station. Being a scientist, he was not ready to announce his discoveries until

he could give out everything accurately, but he granted me permission to print what he had accomplished.

In the field in which he has been at work every garden and vacant lot in several square miles is the roof of an enormous ant house. The ants are everywhere. Their tiny burrows extend under every piece of ground. The imagination is staggered at their numbers in that limited territory. Their nests are so thick as to form one community of gigantic proportions. And, as there are no feuds existing between families, as is usual with ants, they direct their attention solely toward work, which, from the human point of view, is destruction.

Housewives keep all food on tables which either stand in bowls of constantly changed water, or suspended from the ceiling by wires wrapped in kerosene soaked cloth. Even then the ants make the dangerous passage, either on the backs of the dead who accumulate on water within a few hours. A crumb-dropped on the floor has a black stream passing to and from it within a minute, the scouting ants quickly discovering new forage.

But more important yet, aphids are thick on all the trees and bushes. Investigation has proved that the ants protect these from parasites and the ladybugs, and move the little lice from leaf to leaf, carrying them carefully so not to injure them. This friendly action is due to a selfish cause, the ants preferring to all other food the honey dew excreted by the aphids. They kill the winged parasites, preventing them from laying their eggs among the eggs of the aphids, and fight the ladybugs in person, rushing them in bodies and literally rending them from limb to limb. In consequence the aphids work unmolested, and kill the trees.

Of fruits the oranges are in the greatest danger. As soon as the blossom opens, the Argentine ants swarm up the trees until each flower is black with them, and looks at a distance like a plum. They destroy all the blossoms on every tree and finish the crop before it is started. In Louisiana the orange crop was once important. Now, in the affected districts, there is none. The ant life history as studied by Mr. Day, showed that the larvae which had not hatched last fall hatched early this spring and that from these long dormant eggs the queens were hatched. Many drones and workers also hatched at that time, but no queens hatched later. The existing queens and the new ones then began to lay, the new ones beginning a month later than the others. All have been laying at the rate of 40 eggs a day ever since May and

will continue to do so all summer. As every garden has several hundred thousand queens waiting at home below the surface for the workers to bring the food and care for the larvae, the rate of increase is seen to be almost beyond reckoning. To each queen there is an average of 200 workers.

In their domestic economy the workers attend to the eggs at all stages, nursing the larvae and carrying them from hot to cold and wet to dry places as necessary. They also bring the food. When they become dissatisfied with their surroundings, which happens frequently, they move and colonize somewhere else.

Queens often get the wander fever, and forsaking their followers, set out on adventures by themselves, picking up other followers, which, being retained by caste, will follow one queen as readily as another. The new colony establishes itself across the street or in the next garden. In this way their work is thorough, and as they leave no crack unentered, they spread rapidly.

The warmer the weather the harder the ants work and in the middle of summer they frequently force people to close their houses and go to unaffected districts until the heat has passed.

Infants can never be left alone where there are Argentine ants, the prying little creatures lining up in rows about the child's mouth and distressing it with their bites.

There is really no effective way of keeping them from any place which attracts them except by solid construction. Kerosene on water frequently acts merely as a convenient footing upon which they can pass. The surface of fresh water is almost a sufficient support and as soon as a slight coating of dust collects they can skip across with impunity. Running water is the only effective barrier. Bands of kerosene, crude oil, tar, oils of sas-

safras and citronella, tree tanglefoot, zenoleum, naphthaline, coal tar disinfectants, whale oil soap, sharp edges of tin and fur have all been used as barriers without success.

As the queens often live a dozen years, each laying 6,000 eggs a summer, the increase reaches the astounding figure of 600,000 per cent annually. Ten years, Professor Woodworth believes, will be ample time for the ants to take possession of the whole state unless something drastic is done while there is a chance.

Considering this awful possibility, the results obtained by Mr. Day are especially important. Studying the life history of the ants, he discovered two vulnerable points; one that the workers will carry poison home to the queens, and the other that the queens all hatch from the larvae which have laid undeveloped all winter. Later, he expects to find a way of destroying these brooding larvae during the winter, but at present he is confining his attention to perfecting his poisoning system.

This, as mentioned, has the distinct advantage of being easily conducted. Recently 10 or more people a day have been at the experiment station to receive instructions in handling it, and the result has already been the death of untold millions of ants. If the people in the affected district in East Oakland or in any other section make concerted effort, they can reduce the ants to 1 or 2 per cent of what they are at present. It will take continuous action, but very little on the part of any one person.

Mr. Day's own experiments with one thick will give point to this statement. When he first experimented with poison in syrup, he chose a double block in the district where the ants were thickest. There are 32 houses on it, with many fruit trees and large gardens. Things

had reached a state where life on the block was almost intolerable. Absolutely all means to keep the ants out of the food had failed, and anything that was not eaten at bedtime was gone in the morning. The fruit blossoms had been injured and the trees were so covered with ants that the fruit had in no case progressed beyond the first stages. It was an extreme case. The ants could hardly have been worse.

First he placed one jar containing syrup in each yard, poisoning each with arsenic after four days. Two days later there was already a noticeable decrease and many ant nests were found on investigation to be full of dead ants. Within the next few days he placed 200 jars on the block and within three weeks from the beginning of the work 90 per cent of the ants were killed.

Mr. Day is now experimenting with a formula giving the exact number of jars which should be used to the acre, when the poison should be introduced and how often the jars should be changed. Where there are fruit trees or houses to attract the ants in numbers jars 40 feet apart will probably be recommended by him, exchanging jars containing only syrup for jars containing arsenic or other poison yet to be decided upon every few days for several weeks, and after that length of time, leaving exposed the poison jars until the ants have all sought winter quarters.

In a territory like East Oakland, if the recommendations are followed, instead of being overrun with the insects, the number can be kept down to a few per cent—hardly more than the native ants. Wherever there are fruit trees this plan will undoubtedly be followed, so that the ultimate in-

jury to the crops will be small and the valuable orange crop, which would otherwise be wholly destroyed, will be saved.

The amount of arsenic or other poison to use has not been fully determined as yet, but it will be so small that if a child succeeded in screwing off the top of the poison jar and sucking the sponge it would probably not be injured.

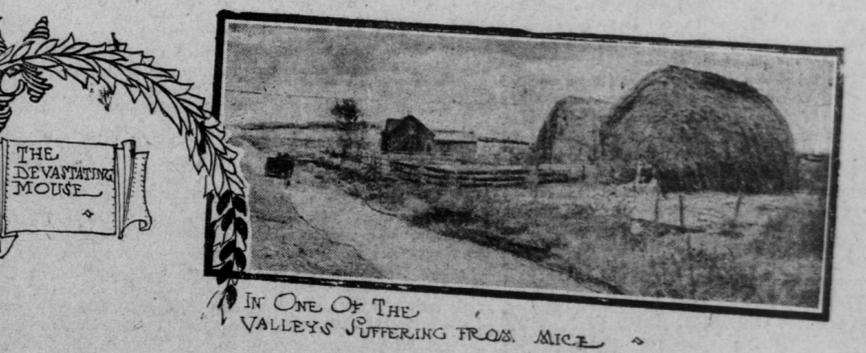
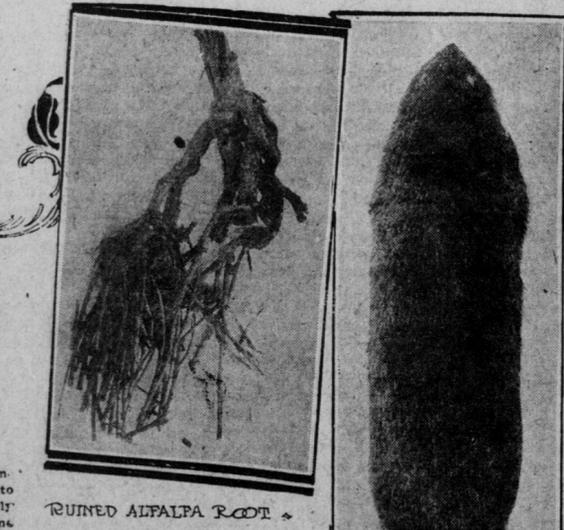
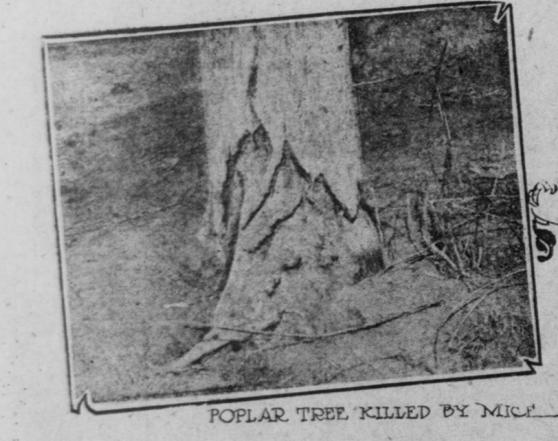
As long as one queen remains the Argentine ants will be with us, so that there is little hope of absolutely annihilating them, but they can always be kept in control by the use of the poison remedy.

There are several ways of discovering whether ants are of the Argentine family. The easiest of these is to crush a few and smell their odor; if they have none they are Argentine; all other ants have a disagreeable smell when crushed. They are black, and the workers—the ones seen—are rarely above one-eleventh of an inch long.

Scientists make certain of their identity by two characteristics which no other ant has; the swelling of the waist is long and pointed instead of being almost a portion of the lower end of the body, and the arrangement of the "teeth," which are really, but the rough edges of their bill like mouths, begin with two long "teeth," followed by three short, one long, three more short, one more long, three short, two long and two short.

Louisiana did nothing to rid itself of the Argentine ant and has suffered the loss of millions. California has discovered a remedy, and it will do well to take heed of what happened in Louisiana.

NEVADA Can Now CURB Its CURSE OF MICE.



By H. L. Pomeroy

TWELVE thousand mice to an acre! And then they lost count.

Not one acre alone, but valleys! There were mice everywhere, thicker than grasshoppers, pockmarking the face of the land with their holes; undermining it, so that the foot at every step crushed into a network of miniature subterranean highways; hopping, browsing and creeping mice, so many and so active that the surface of the country seemed to be a rolling, restless sea.

Whole counties in Nevada and Utah have suffered from this strange migration, more destructive than locusts, more killing than frosts, annihilating every living thing on the surface and eating down until the last tendrils of the roots is devoured.

The ranchers have been helpless before it. It comes upon them gradually and they do not pay much attention until some day they wake to the fact as they cross their fields that there are scurrying mice in every direction. The baby mice do not always escape their heavy boots and they turn to find young mice gasping their last along the trail. Reaching down to see what can be done for the apparently harmless little things, they notice tiny burrows in every direction. Then they realize that they are being visited by a plague.

The mice seem so small and harmless! The ranchers pay no attention to them at all until they have thoroughly established themselves. By that time they are caught like Gulliver in the Land of Lilliput. Eager as the Lilliputians trying each of Gulliver's hairs to a snake, they have set upon every living thing in sight. But, instead of searching the land for something big enough to feed their Gulliver from, they are busy destroying the last of his crop.

Millions of dollars' worth of grain hay and fruit trees have been killed by them—\$300,000 in the lower Humboldt valley in Nevada alone. A way to get rid of them has been discovered now, but before the geologists of the department of agriculture took a hand, there seemed to be no effective poison. Wheat soaked in a deadly solution of phosphorus in carbon bisulphide, a cheap and effective poison, was generally the first remedy tried by the ranchers. It killed mice, but everything else too. Animal life of every kind was destroyed, and the birds that flew that way found death. The larks and meadow larks suffering along with the magpies and crows. The skunks and coyotes then came in and ate the poisoned mice and birds and they also died.

The rancher can not afford to lose these, his best friends. Perhaps ranchers, who have never been afflicted with a plague of mice, will look a little askance at the naming of skunks and coyotes as among his intimates, but where the mice have once been, these despised animals are sacred. And along

with them can be considered the weasels and wildcats, who come down from the mountains of nights to gorge on the mice. Birds are not wanting either, hawks and owls congregating by the thousands. But all of these together are not able to stop the plague of mice.

These able assistants failing, either from the overwhelming number of mice or the poison spread, some of the more up to date ranchmen have attempted to start contagious diseases among the mice, but they are robust little creatures and throw off the bacilli. This remedy has never been known to be successful where a mouse plague had really started.

It was not until a year ago, when the destruction was beginning to mount into the millions, that a solution to the problem was found. At that time George S. Webb, who owns a big ranch in the Humboldt valley which had been practically ruined by the mice, called upon the biological survey for assistance. The response was prompt, and after exhaustive experiments there and in various places in the west an effective remedy was discovered. All farmers would do well to remember it: Alfalfa or other hay, poisoned with strychnine sulphate, scattered over the fields in

the winter time. With the coming of spring the mice will be decimated and the end of the plague in sight.

This preparation broke the plague in the Humboldt valley after it had had its own way for three years. During that time the yearly average loss per acre was \$20. Ordinary crops in that section bringing about \$40 to the acre the loss was exactly half, and the half saved was represented mostly in fields which escaped altogether on account of their isolation. Where the mice had

been at work they left nothing but honeycombed earth. There was no advantage in changing crops, the mice ate everything.

The first time great damage done by mice was ever noticed on this continent was on the Rodgers ranch, in the lower Humboldt valley, in the spring of 1909. Nothing much was done about it until the winter of 1907, and by that time the whole lower end of the fertile Humboldt valley was beginning to suffer. The hay crop had been reduced by a third, all potatoes and root crops had been destroyed and the mice were concentrating their attention on the alfalfa roots.

Millions of mice, a little over two inches long, with beautiful fur and dainty little feet, were at work above and below ground. No serious attempt had been made to exterminate them except by the birds and animals. Under the rows of poplar trees, about the base of fence posts and scattered everywhere throughout the fields were scraps of bones and pieces of fur from the tiny destroyer—evidence of the good work of the birds. Holes dug by eager paws and upturned nests showed where the skunks and coyotes had done their share. But before the snow came that year the country was practically ruined. As many as 175 mouse holes were counted to the square rod and the ground broke beneath the foot like the Arctic tundra in the summer when the frost has left it soft and spongy. Fields were plowed up as hopeless, fruit trees were girdled and even the hardy Lombardy poplars were killed.

The plague spread rapidly up the Humboldt and its tributaries into Paradise and Little Humboldt valleys and about Winnemucca, and Battle Mountain. Most of the country is covered with a natural growth of wild

clover, and here the mice propagated and had of the land they had laid waste tracts of thousands of acres. In large sections they are still busily at work.

Then the plague began to spread over a wide area. It became an invasion of the Humboldt valley had spread to this section, but the need of help was not so great, as the valley was particularly well favored with coyotes, hawks, owls and weasels. On one ranch containing less than 5,000 acres, where the birds and animals were not interfered with, it was estimated that they were killing over 20,000 mice a day, but even that was not enough to stop the plague. The fields were overrun with animals and the fences lined with birds, all seemingly unafraid, either intuitively knowing that they were not to be molested, or too engrossed in the ravenous devouring to give heed to caution.

Early last spring it was discovered that 25 per cent of the crop, in spite of this protection, was already destroyed and that each female mouse was about to have a family of eight or ten. It was plain that no ordinary remedy would do. Even the friendly

creatures of the field would soon be gorged and lazy.

The ranchmen, having the fate of the Humboldt valley well in mind, secured government co-operation and all directed their attention toward fighting the plague under the direction of the biologists. Each acre was a battleground, to be won and lost and won again a dozen times. The fight was so steady, however, and the mice were so diligently poisoned that the plague did not grow worse. By the use of alfalfa hay poisoned with strychnine sulphate, next winter, the last of the mice will disappear and the plague will be ended.

It takes several seasons for a mouse plague to get under way, but once in full swing it is very difficult and expensive to stop. In valleys which have escaped the plague the ranchmen are inclined to make light of the busy little animals, but they learn before a second season is passed that they have a host on their hands.

To show the danger, the government has sent reports of the mouse plagues conquered to the ranchmen in the valleys likely to be affected, and where these have been read the ranchmen are on the lookout for any unusually large mouse families.

The tiny little animal which produces the plague is generally called the "black mouse" or "Carson mouse." Its kind has been busily destroying crops the world over, but never showed as a serious menace in North America until the plague of them, which is now being conquered. The black mouse lives in most of the intermountain country, in the valleys of Utah, Nevada, north-eastern California and eastern Oregon. The valleys in which it is found are all restricted by the surrounding mountains and end in some interior lake. In consequence a concerted effort can usually be made successfully against them.