negligence and mismanagement of the owners of the forests and the manufacturers of forest products;

The absolute necessity of expert entomological advice as a guide to doing the proper thing at the proper time and at the least expense to secure the best results.

CYANIDE AS AN INSECTICIDE

By R. S. Woglum, *U. S. Bureau of Entomology*, and
William Wood, *Los Angeles Horticultural Commission*

Cyanide of potassium has been used for many years as one of the ingredient chemicals for obtaining hydrocyanic acid gas, the most powerful and successful of gaseous insecticides. The writers are not aware of cyanide of potassium having been previously suggested in literature as an insecticide in itself. From experimentation we have found it most efficient in the destruction of a common form of red ant.

In the rear yard of the California Citrus Substation, of the United States Bureau of Entomology, at Whittier, is a spot of hard-packed bare ground about 20 by 30 feet. This ground contained several scores of exit burrows of a common red ant. During the cooler part of the day ants were so numerous on this spot that it was impossible for a person to walk here without stepping on as many as fifty at every move. The insect became such a nuisance that steps were taken for its control. Carbon bisulphide was first tried, but the expense of the material made it prohibitive for so many burrows. Later a spray of cyanide of potassium, one half of an ounce to a gallon of water was used on part of this ground and resulted in destroying almost all ants running about on the part sprayed. This solution, although successful, acted so slowly that it was decided to double its strength. The next evening when the ground was seemingly alive with ants the entire spot was thoroughly sprayed with a solution of one ounce to the gallon of water. This not only very quickly destroyed all ants on the ground, but also such as emerged from the burrows several minutes afterward were overcome by the fumes which were given off from the damp ground. The following day less than a quarter as many ants were moving over the ground as previously. The dead ants had been collected into heaps at different places by those which remained alive.

No farther efforts to exterminate were made for two weeks, at the end of which the ants had become almost as numerous as ever. Then a pit large enough to hold a quart of solution was hollowed out at the

exit of each burrow and filled with the poison. The whole ground was gone over in this manner. An examination was made the next day and resulted in finding less than twenty-five live ants on all the ground treated. In and around some of the pits were heaps of dead ants which apparently had been carried out by such members of the colony as escaped destruction. A second treatment of these colonies usually reached what still remained alive. Where no dead ants had been brought out, probably the entire colony was destroyed. One of these burrows was opened up with the result of finding pockets filled with dead ants as much as one and one half feet below the surface. A few days after using this insecticide the pits were refilled and the ground leveled. Ten days later an examination showed about a dozen fresh burrows of apparently very weak colonies. A second yard was treated after the same manner with almost complete eradication.

Our success with this cyanide solution in almost freeing ground of ants by the use of one, or a partial second, application leads us to believe that under favorable conditions ants (at least some species) can be entirely eradicated from a piece of ground by repeated applications. The poisonous gas from this solution must penetrate deep into the ground. A strong odor of the gas was evident in a burrow opened up two days after the solution was applied. It is entirely possible that this solution will prove of some value against the ground colonies of the Argentine ant.

The success obtained against the ground form of ants suggested that the insecticide might be put to some use against various ground forms of insects as woolly-aphis, thrips, etc. To determine this point it was first necessary to learn if the solution was injurious to plant life. Two gallons were poured around the base of a large orange tree; Jerusalem cherry bushes and nursery trees of the orange and peach were treated with from one to two quarts of the solution. The orange tree was severely injured, some of the nursery stock was killed while the Jerusalem cherry bushes were injured more or less. This result would appear to demonstrate that the solution is injurious to plant life, which fact would place a limit upon its usage. The cost of the solution is from 1½ to 2 cents per gallon.

The use of potassium in powdered form for the destruction of ants was recommended in 1904 by Prof. H. A. Gossard in Bulletin 76, Florida Agricultural Experiment Station, pages 215–16. The trial of this substance against white ants is suggested in 1905 by the same

writer in the Florida Bulletin 79, page 313. Professor Gossard also mentions this method of destroying ants in the third issue of the JOURNAL, June, 1908, page 190. A solution possesses certain advantages over a dry powder. There is no danger for example of chickens picking up the particles if the former is employed. It is evident that this insecticide can be used to some extent at least against subterranean insects. More experiments are necessary to determine the limitations of this powerful insecticide along this line.

E. P. FELT

THE ECONOMIC ENTOMOLOGIST IN BUSINESS

By H. L. FROST, *Arlington, Mass.*

Each year as transportation facilities improve and natural products from all parts of the globe are assembled in one place, the problems of the economic entomologist are increased. With the changes of habitat of the various species of plant growth comes the unbalancing of Nature's control of both injurious and beneficial insects. Thus, the entomologist of today cannot be simply the man of scientific knowledge, but must debase his profession by combining his science with practical business in order to fill his position to the best advantage. Will he gain or lose by this change? His remuneration will be increased to a greater or less extent according to his business ability, but his glory of achieving honors by scientific research will be lessened because of his lack of time to carry on both branches of the work.

It is the purpose of this article to show in brief the great need of commercial economic entomologists. The profession is in its infancy and might be compared to the day of the medical profession when the patient was bled for every disease. Injurious insects have increased faster than remedies or natural enemies, and this is the problem to be overcome by our scientific and trained men. The value of all kinds of trees which suffer most from insect depredations has developed a hundred fold in the last decade. Owners everywhere are calling in vain for help to save trees which have required years to mature.

Fortunately, we have had a generation of scientific men, peers to none, who have devoted their lives to the study of insects. They have given and are giving us information, which is both complete and accurate. Our failure is our inability to make use of this research by securing and applying practical remedies. This is the field which offers unlimited opportunities to the present generation.

A proper preliminary training will be found of great service, but should be very broad in order to make a success of this work. Even