OWNERS SHOULD SPRAY INFESTED TREES AND SHRUBS WITHOUT DELAY.

The very extensive practical and experimental work of this office for the destruction of the San Jose scale carried on during the past four years has now demonstrated the possibility of keeping this insect in check by an occasional treatment. and, indeed, of almost completely clearing an infested orchard, under fairly favorable conditions, by one or two sprayings of the trees with one of the lime and sulphur washes. The materials for these washes are not costly, are easily obtained anywhere, are prepared for use by simply boiling them together, according to the directions following, until dissolved, and are applied with an ordinary spray pump such as is commonly used in orchard work.

These facts bring the San Jose scale wholly within the control of the owner of infested premises, and make it, in fact, one of the most easily managed of the serious insect pests of horticulture; and as soon as they are commonly understood and universally and thoroughly applied, the San Jose scale will no longer be especially destructive or dangerous to fruit in Illinois. On the other hand, our experience of nine years with this pest in this State has emphasized the conclusion that, left to itself, it will make profitable fruit-growing impossible, and will presently destroy completely any orchard which becomes infested with it.

While by far the greater part of the State of Illinois is entirely free from the San Jose scale, and has never been infested by it, its general extension to nearly all orchards in one considerable area, and its occurrence in a small way in several towns, puts its complete suppression quite beyond the power of this office under any appropriations now available or likely to be made. Hitherto, in virtue of a provision of law requiring the Entomologist to give one thorough insecticide treatment to all premises which he has reason to believe had become infested by the San Jose scale before January 1, 1899, virtually all state insecticide work has been done without charge to the owner. It is now nine years, however, since the San Jose scale was discovered in Illinois, and it may be said, as a general rule, that all trees infested six years ago are dead or practically worthless. It is, at any rate, virtually impossible to distinguish any longer between those which were infested at that time, and those which have become infested since. This feature of the law must, consequently, become practically inoperative, and it will fall to the
owner of infested premises either to treat his place himself or to pay one-half
the expense of the treatment by the State.

As the area actually infested makes it certain that no further insecticide
operations can be carried on by the State until a new legislative appropria-
tion is made, it would be the height of unwise to wait for such action,
especially as the extent of territory infested would make it very uncertain,
at best, when any one's premises might be reached.

Furthermore, the owner's share of the expenses of a spraying party, in-
cluding, as they must, the cost of travel, transportation of equipment, office
expenses, and the pay and subsistence of all the men, will often necessarily
amount to more than the full expense of treatment by himself.

There is, in short, no further reason or excuse for delay in spraying in-
fested property. As trees can not be effectively treated for the San Jose scale
after the leaves have put forth, this treatment must now be given during
the winter or early spring. It is thus highly important that all whose prem-
ises are infested should proceed against it at once, both on their own account
and in the interest of their respective communities. To this end the following
directions for the preparation and application of the lime and sulphur washes
have been prepared. They embody the results of four years' practical expe-
rience with these insecticides, and will be found a sufficient guide to their
effective use.

It is to be understood that these washes are never to be applied while
the tree is in leaf, and that although they are effective at any time after the
leaves have fallen, they may be best used in late winter and early spring,
before the buds have begun to open. So used, we have found them harmless
to trees and shrubs of every kind, and generally effective except where a
heavy rain has followed soon after the application. In such cases the trees
must, of course, be treated again.

It is better that all infested Osage orange hedges should be destroyed, as
the scale breeds as freely on this plant as on any orchard tree, and it is diffi-
cult to spray such a hedge so thoroughly as to reach most of the scales. Trees
so heavily infested as to be practically worthless should be dug up and burned,
since it will not pay to spray them. Even though the scale insects may be
killed, the effect of their injuries will usually be fatal to the tree. Very large
trees and those with a brushy top should be pruned before spraying, and
thickets of plum, peach, and the like, along fences and beside roads, should
be cut out and destroyed.

Any premises which have once been infested by the San Jose scale must
be carefully examined from time to time, especially in the fall, no matter
how thoroughly and effectively they may have been treated; and whenever
the scale becomes again noticeably abundant the infested trees must again
be sprayed, care being taken to extend the treatment far enough to include
adjacent trees to which the insect may possibly have spread. My spraying
parties have now been actively at work in all parts of the State in which the
San Jose scale occurs, and methods of procedure have thus been demonstrated
on a large scale to most of those concerned.

I need hardly emphasize the importance of common action by all the peo-
ple of an infested district, since unless all act together an orchard virtually
freed of the scale will gradually become reinfested from adjacent premises.
It should be understood, however, that even under the most unfavorable cir-
cumstances each fruit grower may protect himself by careful observation and
methodical work.
PREPARATION OF THE WASHES.

THE OREGON Wash.—The materials for the preparation of the Oregon wash, which is the insecticide mainly used by us during the last four years, are as follows: Common sulphur in powder (flowers of sulphur), 15 pounds; unslaked stone-lime, 15 pounds; blue vitriol, 1\(\tfrac{1}{2}\) pounds; and water, 50 gallons. To prepare a 50-gallon barrel of the wash, proceed as follows: Heat 5 to 10 gallons of water in an iron kettle, and while this is heating weigh out the 15 pounds of sulphur and the 15 pounds of lime, keeping the two separate, and mix the sulphur with hot water into a thin, smooth paste. When the water in the kettle is about ready to boil, pour in the lime, and as soon as slaking commences add the sulphur paste and stir the mixture vigorously. A violent boiling immediately takes place, and water should be kept at hand to pour on the boiling mass to prevent it from running over the kettle. Use as little water as possible, stir continuously, and do not allow the mixture to boil over. When the lime has finished slaking the violent boiling ceases, and the mass should be thick and stiff. Keep it steadily boiling for forty minutes, or until the lime and sulphur have thoroughly entered into combination. The mixture becomes thinner as it boils down, and changes from a deep orange-red through several shades of greenish and yellow, ending with a deep amber color. Next add the 1\(\tfrac{1}{2}\) pounds of blue vitriol, in fine crystals, stirring this into the mixture, kept at boiling heat, until they are thoroughly dissolved, which will take about 15 minutes additional. Now add hot water enough to make 50 gallons, and spray upon the trees immediately. With a large kettle twice the above quantities may be used, making enough of the solution to fill two barrels with the wash at a time. If hot water can not be conveniently supplied for diluting the wash, cold may be used, although the fluid is then more liable to clog the spray nozzles.

If a supply of steam is available for cooking the mixture, this will be found much the more convenient source of heat. The cooking is then done in the barrels from which the fluid is sprayed, and the disturbance caused by the introduction of the steam makes stirring unnecessary. When cooked with steam the mixture does not ordinarily become so dark as when boiled over a fire, but the insecticide effect is, nevertheless, the same.

THE CALIFORNIA WASH.—The California wash is made precisely like the foregoing except that 15 pounds of common salt are substituted for the 1\(\tfrac{1}{2}\) pounds of blue vitriol. This has no advantage over the Oregon wash, except cheapness in some places, and has less fungicide action, and thus does not so fully protect a tree and its fruit against fungous diseases the following year. The points of main importance in preparing these mixtures are as follows: The water must be hot when the lime is put into the kettle; the lime must be slaking when the sulphur is added; the mixture must be constantly stirred; a minimum of water should be added; and the mixture must be actually boiling, not merely simmering.

Do not spray the mixture against paint, which may be blackened by the sulphur. It is a good plan to have horses used in the spraying operations blanketed, as the dried mixture is hard to remove from the hair. Persons preparing or applying the spray should avoid getting it upon the bare hands or face, as it is very caustic. The undiluted mixture should not be left in the kettle over night, as it is likely to harden and cake, and is then worthless. See that all barrels and all apparatus are thoroughly cleansed before using the mixture in them, otherwise the nozzles are likely to clog. Thoroughly clean kettles, hose, barrels, pumps, nozzles, and all spraying apparatus when the work with this wash is over for the season.
Use this wash on the trees after the leaves are off, preferably late in the spring, before the buds have commenced to open. Never use the wash on trees in leaf. Thoroughly coat the trees, being careful to cover the smaller twigs and branches and to get the mixture in all the forks and crevices. Do not attempt to spray from one side only.

APPARATUS AND EQUIPMENT.

The apparatus used in preparing and applying these washes will depend upon the size of the orchard to be treated. In ordinary orchard practice the cooking can best be done in an iron kettle holding at least forty gallons. In this the mixture is boiled. If the spray is to be diluted with hot water, a second kettle of this size will be necessary in which to heat this water. In preparing smaller amounts of spray, kettles of smaller size may be used.

When cooking is to be done by steam, no kettles are necessary, as both the cooking of mixture and the heating of water may be done in 50-gallon barrels, such as have been used for oil or vinegar. Portable steam-cookers are now made for such purposes. Those used upon the farm for cooking stock food are also sometimes used. These steam-cookers are, however, not essential, and for ordinary orchard work the kettle and the open fire, not considering convenience, are just as good.

The mixture must be strained as it is poured into the tank or barrel from which it is to be sprayed. Such strainers are manufactured for the purpose from brass to prevent corrosion by the liquid. The strainer part should be of fine mesh—about twenty to the inch.

The question of pumps is an important one. Either bucket or knapsack pumps may be sufficient in cases where only a few trees or shrubs are to be sprayed. For very extensive orchard treatment, power spray outfits run by steam, compressed air, or gasoline are now upon the market. For independent use for the small fruit grower, these machines are, of course, expensive. The pump best suited for his use will be a good hand-power pump fitted securely to a barrel or tank—a pump of the same sort as he has perhaps already for applying arsenical sprays or the Bordeaux mixture. For the lime-sulphur washes these pumps should have no copper about them, but the working parts should be of brass. They should have no valves of leather. Instead, brass valves ground to fit perfectly are preferable. The working parts should be easily accessible and easily replaced if broken. Have an agitator with both vertical and horizontal movement. Jet agitators are not satisfactory with any kind of hand-power pumps. Have each pump fitted with 2 cut-off cocks, with 25 to 35 feet of best black four- to five-ply half-inch hose attached to each cut-off. Extension poles are necessary. Bamboo poles with iron or brass lining, 8 to 12 feet long, fitted with good cut-off valves at their base, will be found best. Double Vermorel nozzles have given the best satisfaction with these washes. They are fitted with spring disgorgers to clean them when clogged, and come with extra brass caps. A good hand pump with fittings complete, as just described, may be bought for $18 to $25, depending upon size of the pump and the number of accessories.

Further information as to pumps and other apparatus, materials, and application, will be promptly given by letter to any applicant. I can not too strongly urge prompt and general action for the control of this extremely dangerous and destructive insect, such as will put an effective check upon it before the opening of another season gives it another year's lease of life, and opportunity to increase and extend its injuries.