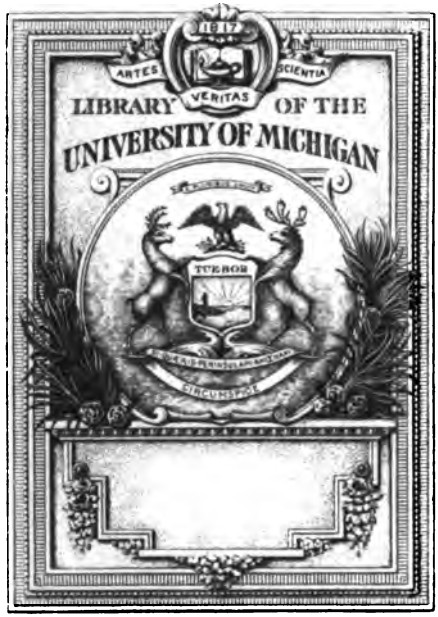

VOLUME VIII No. 1

MONTHLY BULLETIN

OF THE

STATE COMMISSION OF HORTICULTURE

NINE-YEAR-OLD BLENHEIM APRICOT TREE AFTER ANNUAL PRUNING BY "WINTERS SYSTEM."

SACRAMENTO, CALIFORNIA JANUARY, 1919

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THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

Acceptance for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917; authorized August 27, 1918.

Vol. VIII. January, 1919. No. 1.

AGRICULTURAL STATISTICS.

The demand is becoming more and more insistent for accurate statistics on the acreage and production of the leading crops of our state. After this country entered the war we were brought face to face with the fact that in spite of everything that has been done thus far to gather such figures we are still unable to furnish either our government officials or the public in general with information that is wholly reliable.

Never before has the value of authentic reports been brought home to us in such a forceful manner. There has always been a great demand for such statistics as this office has been able to gather and from year to year the work which we have been doing in this line has been broadened until very much more ground is covered today than formerly. Commercial interests as well as prospective settlers frequently seek accurate information on California crops and in the past such information has been very difficult to obtain. The value of these reports as an aid in the disposition of our crops is well understood by those who are in the business of handling and selling the products of the farm. The U. S. Bureau of Crop Estimates, with headquarters for this state in San Francisco, has been co-operating with us and together we have built up a system of crop reports which to a certain extent has met the demand. Each year reports are issued monthly on the condition of the various crops grown in the state. Of recent years the work has been enlarged upon and now in addition to condition reports there are issued estimates of the probable total yield of certain crops during the season. Wherever there has been a satisfactory check on these estimates they have been found quite reliable.

The knowledge of the good work that is being done by the U. S. Bureau of Crop Estimates induced the State Commissioner of Horticulture to suggest last year's co-operative work with this bureau which would enable their organization and this commission to bring about better results than have heretofore been possible. Through the county horticultural commissioners this office has been enabled to secure reports on the condition of crops throughout the growing season. In addition to these reports the commissioners have furnished annually figures on acreage, and

in many cases production, of the leading fruit crops. For the past two years condition reports which represent the co-operative effort of the U. S. Bureau of Crop Estimates and this commission have been issued monthly as a compilation of the reports from the county horticultural commissioners and the regular reports of the voluntary reporters of the bureau.

This office has been cautious about publishing figures that have been received, knowing of the impossibility in many cases of securing reliable information and fearing that grave errors would materialize should they be published. However, the time has come when it is felt that the figures which are being secured in the manner described are the most accurate that it is possible to secure anywhere. With this thought in mind the State Commissioner of Horticulture is planning to publish, about the first of April, a special statistical number of the Monthly Bulletin. This number will be edited jointly by the Bureau of Crop Estimates and the State Commission of Horticulture. It will contain information on the area and production of fruit and other crops in detail and will be the most complete compilation of this nature that has ever been published. We realize that in spite of the most careful work upon the part of the Bureau of Crop Estimates and this commission some errors will creep in but the figures published will serve as a basis for future computation, and we feel sure will be much more accurate than anything of the kind that has yet been available in California. G. H. H.

PROGRESS IN STANDARDIZATION WORK.

[Summary of Report to State Commissioner of Horticulture.]

Standardization by law is new in California and therefore it has been necessary to do much experimental work since the two standardization laws became operative in the state. At no time has the necessity for working out a safe and sane course of procedure as a foundation for future work been overlooked. One of the chief difficulties encountered by the State Horticultural Commissioner is the non-uniformity regarding the enforcement of these laws by the fifty county horticultural commissioners of the state. The work of certain county officials is commendable and in most of the principal fruit-shipping counties tremendous good had resulted through the enforcement of these laws by the county horticultural commissioners, yet in some other important counties scarcely anything has been done, and were the state-wide effort of like proportions standardization by law could be branded as a failure.

STANDARDIZATION DEPUTY.

The need of a standardization deputy to bring about a uniform enforcement by county horticultural officials in the various counties of the state can scarcely be overemphasized. Such an official should spend his entire time in the field working on standardization problems. Without such a deputy it is absolutely impossible to have the law enforced in a like manner in every county of the state.

PROBLEMS.

A number of problems stand out prominently, principal of which are:

1. The problem of preventing the shipment of green, immature fruit;
2. The problem of uniform grading;
3. The problem of determining the most satisfactory package for the packing of each fruit and the standardizing of same;
4. The problem of picking, handling, packing and transporting fruit with less bruising;
5. The problem of amending the standardization laws so that some of the present weaknesses may be overcome.

GREEN FRUIT SHIPMENTS.

Nothing has injured the reputation of California fruits more in times past than the shipment of green or immature fruit, which has been placed on the markets of the country early in the season. Apricots, peaches, grapes and oranges alike have been picked when there was very little trace of color and when there was practically no other sign of maturity, simply because it was the desire of the growers, packers and shippers to take advantage of high prices, which practically always obtain during the early part of the fruit-shipping season.

ORANGE STANDARDS.

The maturity test for oranges, which requires that they shall contain 8 parts of soluble solids to 1 part of acid, has been more or less of a failure north of Tehachapi. Tons of oranges have been picked which showed little or no trace of yellow or orange color. These oranges were perfectly green, and while the color has been sweated into them they are inferior and naturally are a great disappointment to the consumer, who purchases them because of their artificial color, not knowing that it was not brought about by natural ripening on the tree. The possibility of a double standard combining the 8 to 1 test and a color requirement, in addition to the substantially colored requirement of the present law, is suggested.

GRAPE STANDARDS.

The fresh fruit standardization law as it applies to grapes is very satisfactory. The enforcement of the requirement that grapes must contain 17 per cent sugar, except in the case of Emperor, Cornichon and Gros Coleman, which must contain 16 per cent, has been enforced uniformly by the county horticultural commissioners in the grape growing districts of the state. The industry has practically been put on its feet by this provision of the law.

UNIFORM GRADING.

The grading of certain fruits, especially apricots and plums, is faulty. The sloping side basket, which is used in the packing of these fruits, is packed with smaller fruit on the bottom than on the top. The difference is so great that the packing is often very deceptive and is not conducive to the best interests of the fruit industry of the state. A straight side basket, which would require uniform grading, should be required by law.

STANDARD PACKAGES.

The box which is generally used in the packing of apples at the present time is not scientifically correct for the various sizes to which apples naturally conform. A standard box of the following dimensions, which is used in the northwest and commonly known as the "Northwestern box," should be provided for by law. Depth of end, 10½ inches; width of end, 11½ inches; length, 18 inches. This box has a cubical content of 2,163½ cubic inches.

BRUISING.

The bruising of fruit is responsible for a large amount of decay. Sometimes this bruising is due to carelessness in picking and packing and sometimes to overloading in the cars. The immense loss of fruits that have been carelessly handled between the time of picking and the time that they eventually reach the consumer should be prevented.

BY-PRODUCT FACTORIES.

In the enforcement of the standardization law the officials have experienced much difficulty in determining the disposition of condemned fruit. There is a notable scarcity of by-product factories in some of the more important fruit growing sections. For example, the big deciduous fruit district surrounding Auburn, Newcastle, Penryn and Loomis in Placer County has no by-product factory for handling overripe or otherwise unfit fruit for a standardized pack. An up-to-date by-product factory, it is believed, is an economic necessity.

APPLE ACT ENFORCEMENT.

A number of testimonials have been received by the State Horticultural Commission indicating that the enforcement of the apple act had resulted in immeasurable good to the industry. The sale of grade stamps by the State Commissioner of Horticulture last season, as provided for by law, brought in a total sum of $9,975.37. This money was used for the employment of inspectors in the apple growing districts of the state. In addition to a standard apple box requirement, the law should also provide for a standard label to place on the label end of the apple box, and more strict requirements for the California Fancy and B grades.

RECOMMENDATIONS FOR CHANGES IN THE FRESH FRUIT STANDARDIZATION LAW.

The fresh fruit standardization law would be materially strengthened if amended in such a way that the term "practically free" from insect pests and disease were defined.

The possibility of the adoption of an amendment providing for a straight side package for such fruits as apricots and plums instead of the present sloping side container, which is not satisfactory, is suggested; also a straight side berry basket is superior to some of the sloping side baskets that are now in use and an amendment is being considered which will provide for such a container. G. P. W.

THE HIPPODAMIA INVESTIGATION.

About a year ago the writer announced in these pages that a study of the use of *Hippodamia convergens* in the control of aphids was to be undertaken by the Bureau of Entomology of the United States Department of Agriculture, in co-operation with this commission. In this issue of the Bulletin there appears a report of the progress of this investigation. Some important points are brought out in this paper to which we should like to direct attention. One is in regard to early shipments into the valley of the colonies of ladybirds. Mr. Davidson has shown that the ladybird, for certain seasons at least, is capable of breeding earlier in the year than had been supposed and from this fact, taken in connection with the obvious one that at least one generation must be gone through before there is sufficient increase to enable the predators to make any headway against the aphis, he is justified in concluding that it would be much better to have the ladybirds arrive in the valley earlier in the year. This plan will be adopted for the coming season. It should be mentioned that while this work was inaugurated as a control for the melon aphis, it has gradually developed that in order to check that species it is better to release them early in the year so that there will be plenty of opportunity for them to increase before the melon aphis becomes abundant, and also in the hope that they would exert a controlling influence by destroying the colonies of this species which overwintered on native weeds.

Another important point brought out by Mr. Davidson is the fact that the ladybirds, in spite of a local abundance of food, disperse very quickly from the point of colonization. This has a bearing on the method to be followed in liberating the beetles in the valley and precludes the necessity of sending them to individual growers.

The Bureau of Entomology has kindly consented to continue the investigations for another season and by that time we believe that we will be in a position to say definitely just what is the economic value of this type of work. H. S. S.

A Typical Apple Orchard in Kern County, California.

THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VIII. January, 1919. No. 1.

EFFICIENCY MANAGEMENT OF CALIFORNIA ORCHARDS.

By J. B. WHITTEN, Berkeley, Cal.

The recent arrival in California is always impressed with the magnitude of our horticultural resources. He finds flowers always in bloom. Fruit of one kind or another is always on the tree. He sees more species of plants that he doesn't know the name of than can be found in a trip through Europe! In addition, he sees all the species he has ever seen elsewhere in his whole life, greeting him as old friends among strangers. This makes him feel at home, even in a world unknown to him. The buildings all have good architectural lines. Their beauty is an asset to the state. Neither ill proportions nor incongruities offend the eye. The houses are mantled with vines and the grounds are tastefully planted. The artistic tastes of every clime seem to be represented and always in a fitting way. The homes, from the humblest to the most elaborate, look restful, sweet and inviting. They suggest the homes of horticulturists, for the horticultural temperament goes with good taste, scrupulous care and the spirit of progress.

The above impressions strike the visitor in California, whether or not he is a horticulturist. If he is the latter he is pleased to conclude that California is the greatest horticultural field in the world and thinks no more than that can be said.

In common with other new arrivals in California the writer experienced the pleasure of all the above impressions. After a brief three months in which to get acquainted with horticultural conditions and with horticulturists he has reached the conclusion that to simply pronounce California the greatest horticultural field in the world is by no means all that can be said. Great as its present development, it is not great enough to give us an adequate conception of its possibilities for future growth.

There are districts in the state in which one finds practically all important species of fruits developing side by side and ranging from the tropical date and avocado, through the semitropical citrus, fig and olive to the hardy species of apple, cherry, plum and others of the north temperate zone. Where else can one find such a range of species adapting themselves to a common environment? Nowhere that I know. This furnishes a unique variety of fruit products and gives opportunity for a varied horticulture as well as for choice of a specialty.

There are other districts so uniquely well adapted to a given kind of fruit that a single species dominates. That logically leads to an almond section, an apple section, a cherry section or a prune section. Not only may a given farm be planted solid to a single kind of fruit, but adjacent farms are often likewise planted until an extensive section becomes virtually one continuous orchard of a given species.

This specialization, where a given fruit is uniquely favored, gives rise to an intensive horticulture such as is perhaps unknown elsewhere in the world. Where the growers in an extensive center devote their energies to a single species of fruit they develop an efficiency in its production and marketing which can not so thoroughly be attained where energies are divided among a variety of products.

California dried, canned and preserved fruit is known the world over. This has been brought about by the fact that enough fruit is produced in a given center to market in quantity, to establish well-known grades and brands and to do the work with organized efficiency.

The continued prosperity of our fresh fruit industry is greatly favored by developing hand in hand with it the conserved fruit products. The latter can profitably utilize fruit which for any reason can not be profitably shipped fresh. It obviates the necessity of putting anything except the best grades in the fresh

fruit package. It extends the period of consumption of the crop and more economically utilizes labor. It keeps the state in the eye of the markets and of the consumers the year around.

Establishing a reputation in the markets is as essential a part of the life of the industry as is successful production. The dealers in fresh and conserved fruit products in the large markets of the East say, without reserve, that the marketing possibilities of California fruit are unlimited, providing the producers put only the proper grade in the package, establish uniform grades or brands and thus induce the marketman and the consumer to demand and depend upon a given brand from a known center of production.

California has done more than any other state in the development of organization in the production and marketing of fruit. Its state commission, its county commissioners and advisors, its co-operative associations and other agencies, including the state experiment stations, form agencies for the efficient organization of the industry and the solution of problems as they arise.

The California fruit grower perhaps bestows more handiwork upon his orchard than is done in any other fruit-producing section. He prunes more systematically, sprays oftener and works the soil more. California orchards looks cleaner than others. For that reason they possess an individuality not so typical of orchards elsewhere. They bespeak the ideals and progressive spirit of their owners.

After what has been said, the layman might suppose that the writer believes ultimate perfection has been achieved in California fruit growing; that conditions are so favorable and practices are so skilled that there are no further problems to be solved and no further progress to be made. The California fruit grower knows better; he knows that where the greatest progress has been made, there the greatest progress is in the making. Every new fact discovered and every new practice developed opens up new questions yet to be solved.

To the experiment station worker with deciduous fruits, California presents the greatest field of opportunity in the world. Great as is our deciduous fruit industry, it is still essentially new. It has had its development in the past half century. It is still confined to virgin conditions as compared with established agricultural development in most parts of the world.

The great diversity of conditions in the state presents a great variety of problems. Many of our successful commercial varieties have been brought from other sections of the world. Many of the varieties originated within the state are proving their worth. No doubt the further adaptation of varieties to local conditions and to special purposes will prove to be a fruitful field of effort.

The question of the best stocks upon which to work our trees is as yet unsettled. Up to date we have accepted the standard sorts available and for the most part they are the ones that have been used in older fruit-growing sections. There is reason to believe that stocks may be discovered or developed which may prove even better for special purposes.

Standard methods of pruning have been successful. Modifications to suit a given variety or a given environment need further investigation.

The questions of spraying, of application of water, soil management, cover crops and companion crops all bring their problems to the grower who wants to know how to render his trees most efficient in the most economical manner.

The growers, out of their active, practical experience, are constantly raising important questions, many of which can not be fully answered without further careful investigation.

The California Experiment Station has done notable work in solving some of the most important and some of the most difficult problems that confront the farmer. It is continually enlarging the scope of its work and is continually adding to the world's knowledge and understanding of the principles and practices underlying agricultural progress. Men who have shaped this work have contributed a world-wide service to the race. The writer feels free to make this statement for the reason that heretofore he has had nothing to do with the work which has placed the institution in the foremost rank. This statement makes understandable the appreciation and the confidence one feels in being permitted to join in the work in behalf of the deciduous fruit interests of the state. Not the least of this satisfaction is based upon the attitude of the fruit growers themselves. They have shown themselves to be awake to the spirit of progress. They have shown a desire to try out new ideas from every possible source and to co-operate fully in working out a sound application of principles to commercial fruit production.

A DANGEROUS SNAIL INTRODUCED IN CALIFORNIA.

By G. R. GORTON, San Diego, Cal.

Some two months ago the attention of the writer was directed to the fact that San Diego County enjoyed the doubtful distinction of being the only locality in America in which there existed the snail *Helix pisana* (Fig. 1), a dangerous enemy of cultivated crops. Steps were immediately taken in co-operation with the Insectary Division of the State Commission of Horticulture to determine the extent of the infestation and the means of control or eradication which would probably prove most effective.

FIG. 1. A destructive snail (*Helix pisana*), a new menace to citrus in California.

An inspection of the locality where the pest was reported showed it was, fortunately, confined almost entirely to a small canyon which extended upward from the ocean, about three city blocks in length, and to some of the level ground contiguous thereto. Strangely enough, the pest has devoted itself more particularly to the wild oats, saltgrass, wild buckwheat, agaves, etc., which covered the vacant property in that vicinity. The snails were, however, found to be exceedingly abundant in this wild growth, hanging crowded together in enormous clusters, especially on the wild oats and buckwheat, which they seemed to particularly favor. Inspector McLean, who first inspected the locality, counted eight hundred snails on a single buckwheat plant less than two feet in diameter and about eighteen inches high.

FIG. 2. Snails (*Helix pisana*) on native vegetation.

Because of the known destructiveness of this species of snail in the Mediterranean region of Europe and Africa, where it is reported to attack both field and orchard crops, especially the buds and blossoms of the citrus trees, foliage of olives, loquats, etc., it seemed imperative that the pest be eradicated while it was confined to this comparatively isolated portion of San Diego County, where there are no citrus or other cultivated crops to any extent for several miles in any direction.

Arrangements were therefore made with the property owners who were a to co-operate in burning over all of the infested area which it was possible in this manner and to spray portions which could not be burned over with a of alum water, in proportions pound of crude lump alum to ei lons of water. In the process of up the owners of the various por the infested area, it was discover in order to obtain quick action possible for this department to ava of a city ordinance which req clean-up of vacant lots under a notice served upon the property fire marshal. Under the circumsta seemed as if matters could be h more expeditiously in this manne to follow the regular course of servi usual form of horticultural notice absentee owners. Copies of this signed in blank by the fire marsha provided and served on the lots in tion, and after the period had e the undersigned and two insp burned over the worst infested pc comprising about two-thirds of the area. The growth covering the p burned consisted principally of wil in a "bone-dry" condition, so th

FIG. 3. Clusters of the snail (*Helix pisana*) on small branches.

burned readily and effectively, in that as nearly as could be determined at that practically every snail within the burned area was killed. Occasional small patch salt grass which would not burn readily were sprayed first with distillate and ignited. Portions of the sidewalk, curbing, etc., were treated with a plumber's torch, fastened to a long handle for convenience, and this method was found very effective, though somewhat slower than if the blow torch had been equi

FIG. 4. The snail (*Helix pisana*) along seawall.

with a device to spread the flame laterally. In spraying the distillate to facilit burning, an ordinary knapsack spray pump was employed. All the equipment wh was used was rather hastily prepared and it is probable as further progress is m improvements will suggest themselves.

Investigations were made in an attempt to determine the possible means which this pest could have been introduced, but no satisfactory explanation w

arrived at. At first it was suggested that possibly the snails might have been introduced with plants imported from Europe to one of the gardens adjoining, but the fact was established that no plants had been imported to this particular garden, so that this possibility was removed. The other possibility which suggested itself was that the pest might have been innocently introduced by individuals for purposes of study, as was the gipsy moth, but there is no basis of fact to substantiate this theory. Mounted specimens which had been collected at La Jolla, where the infestation exists, were found in two local museums. These specimens had been collected and placed there as long ago as June, 1914, although their presence was not reported to this commission until about the first part of September. There was no data on record at either of the museums which would give any clue as to how the snail might have been introduced.

FIG. 5. Snails (*Helix pisana*) clustered on bushes.

Helix pisana is a comparatively small snail, averaging less than three-fourths of an inch in diameter, and is believed to have but one generation a year. Apparently this species remains dormant during the summer, and commences egg laying about November, laying its eggs in moist soil, as does the common species, *H. aspersa*. *Helix pisana* is a daytime feeder.

After the present treatment of infested area has been completed it is planned to allow about two or three weeks to elapse to permit any eggs, which might be present, to hatch, when the locality will be reinspected and additional treatment applied if necessary. In fact, reinspections will be made after that to keep in touch with any live snails which give appearance from time to time.

NOTE: The attention of the State Commission of Horticulture was first called to the occurrence of this pest at La Jolla by Dr. L. O. Howard, Chief of the United States Bureau of Entomology, in a letter dated September 20, 1918. Dr. Howard also forwarded to us a recommendation from Dr. Paul Bartsch, Curator of Mollusca in the National Museum, in regard to the use of the alum solution as a spray for snails, and with which Mr. Gorton is now experimenting.

Mr. C. H. Orcutt, a naturalist living at La Jolla, had, from his personal observations, appreciated the danger and had notified Doctor Howard, who transmitted the correspondence to the commission, offering the cooperation of the Bureau of Entomology if desired.

This snail is considered a very important pest in Sicily, particularly to the buds and blossoms of lemons, and it would be a calamity if it should become so well established as to preclude the possibility of eradication. To quote Mr. Orcutt, "if left to itself it will doubtless spread over all southern California and cause the loss of millions to our gardeners, horticulturists and farmers." De Stefani, the Sicilian naturalist, says in his bulletin on this snail[2], after mentioning the damage

[2]T. de Stefani. "*Helix pisana*, and the Damage which it is Capable of Doing to Agriculture." Palermo, Sicily, 1913.

done to the flowers and young fruit of the lemon, it "gnaws and injures th the twigs, completely denuding them for long distances. * * * Thus t deprived of their bark, die, and when all the finer branches have thus beer to a whitened skeleton the interior of the tree also dies."

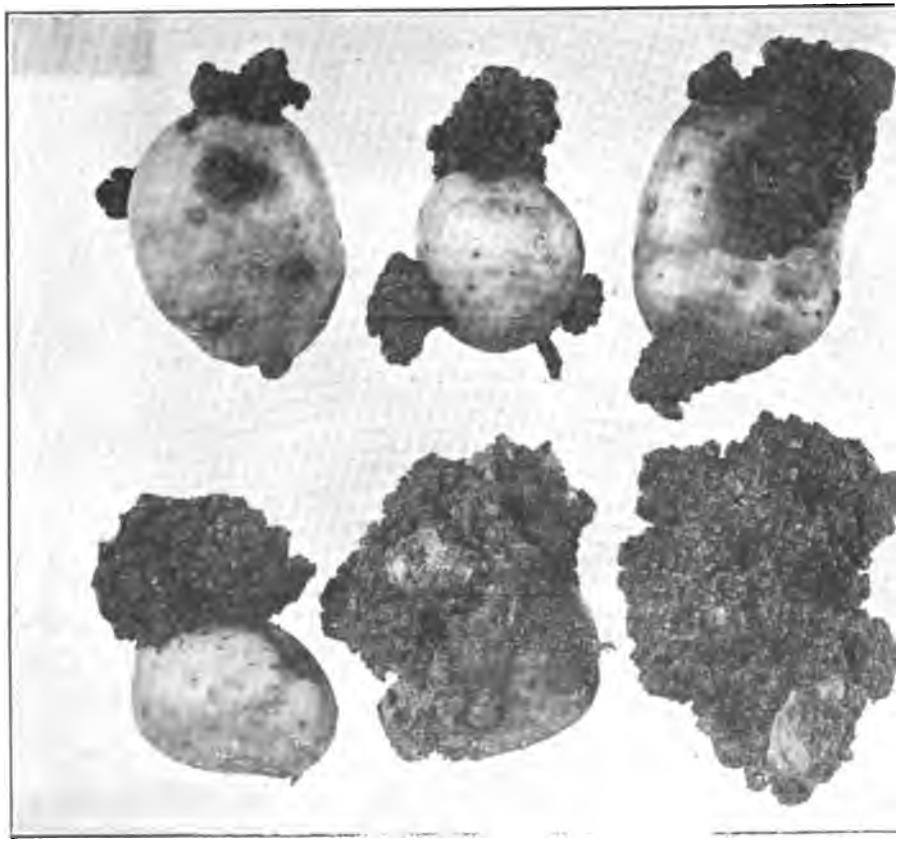
Thus it will be seen that the presence of this snail in California is a m our citrus industry. It is fortunate that it has been called to our attentic it has spread beyond the possibility of eradication. Mr. Gorton has taken the problem in an energetic way, and we believe that by keeping careful the situation for the next few years, in order to destroy any snails which n been missed, it will be possible entirely to eradicate this pest and thus remc might easily have become a great burden to the industry.

HARRY S. SMITH
Superintendent State Insect
California Commission of Horticu

THE EUROPEAN POTATO WART DISEASE DISCOVERE PENNSYLVANIA.

By J. G. SANDERS, Harrisburg, Pa.

The dreaded European potato wart disease has been discovered in the ant mining regions of Pennsylvania in twenty-eight towns about Hazleton, Pa., it occurs in the miners' gardens. A survey undertaken during the past two n subsequent to its finding, has covered in the neighborhood of three hundred

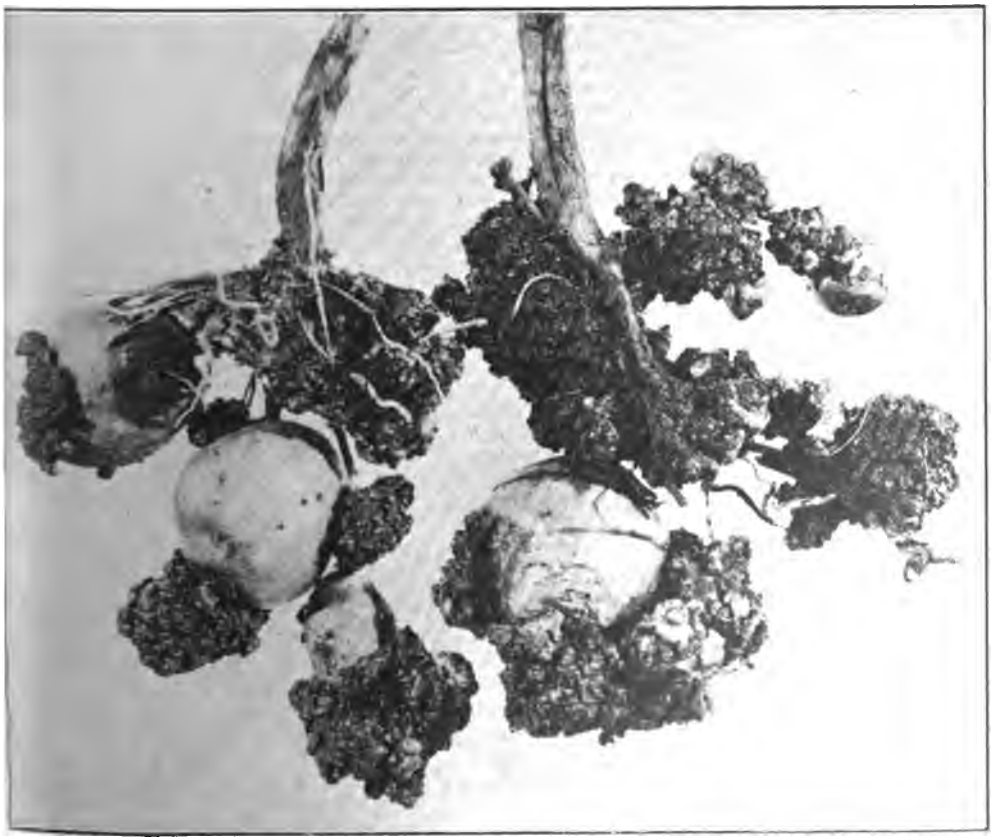


THE POTATO WART DISEASE.
FIG. 6. Various stages of development.

villages, cities and towns throughout the anthracite coal mining district of northeastern Pennsylvania. In no case has it been found in any agricultural section.

The entry and establishment of this disease in this section can be traced directly to importations of foreign potatoes in the years 1910, 1911 and 1912, previous to the establishment of the quarantine of September 20, 1912, by the Federal Horticultural Board prohibiting further importation of foreign potatoes.

The disease has been present in some of the miners' gardens for the last eight years, if one may judge from the terrible havoc wrought by the pest and its general distribution within limited zones: fortunately, immediately surrounding these mining villages are waste lands grown up with scrub oak, huckleberries and general wild vegetation, so that no cultivated land intervenes. Since the consumption of potatoes



THE POTATO-WART DISEASE.

FIG. 7. A complete hill as dug from the soil in moderately infected garden

in these villages far exceeds the production, there is very slight possibility that the disease has been carried out on potatoes.

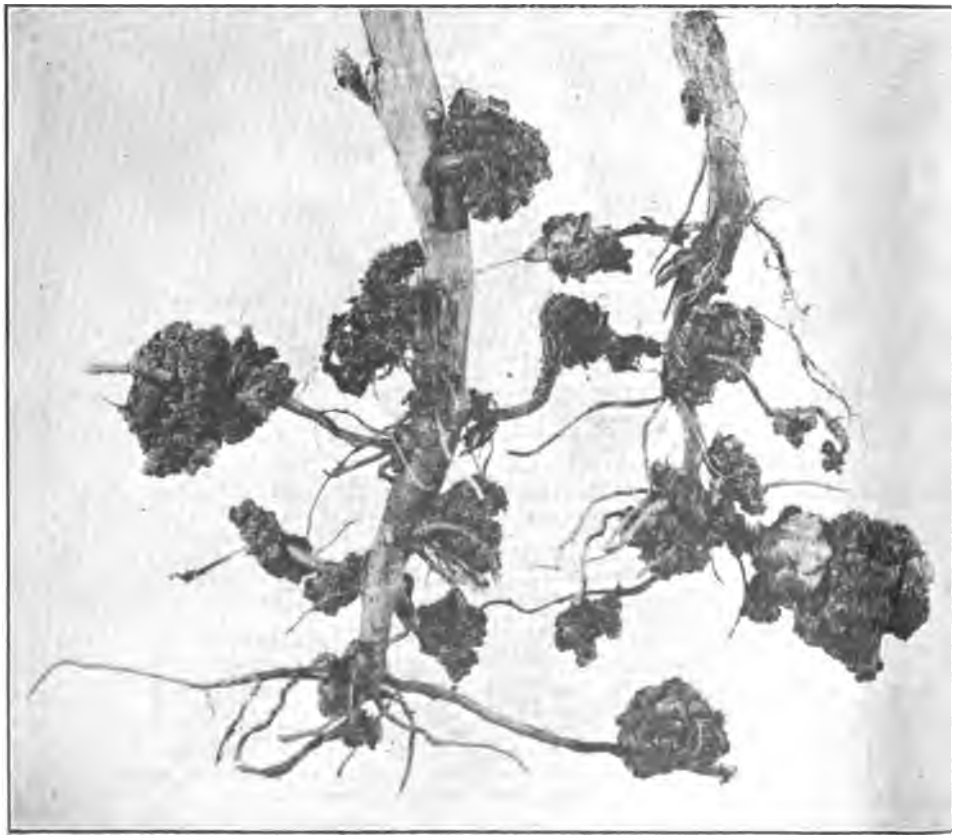
The European potato wart disease (*Chrysophlyctis endobiotica* Schilb.) was described in 1896 from Hungary by Professor Schilbersky, who brought it to public and scientific notice. Since that time the disease has spread into Germany and into the British Isles, and was introduced into Newfoundland several years ago. The more or less accidental discovery of this disease in the mining villages of Pennsylvania is the first report of the establishment of the disease in the United States. The circumstances under which the pest was introduced and has become established should be a warning to all plant inspectors and plant pathologists to watch for this disease in those centers where a considerable consumption of potatoes occurs, and

where the local supply is not sufficient to satisfy the demand, resulting in the us (previous to 1912) of imported potatoes.

By reference to the accompanying photographs, it will be seen that the disease manifests itself in the form of warty growths, starting frequently from or near the eye of the potato. These growths gradually enlarge and multiply until they cover the entire tuber, and change completely to a warty mass, appearing like a piece of cauliflower, which quickly decays in the ground, leaving the hard-celled spores to perpetuate the disease in the soil. These warty growths may appear on any portion of the plants, including stems and foliage, but they are most abundant on the underground portions of the stem and tubers. Where serious infection occurs no potatoes are produced, but in newly infected soil only a portion of the tubers in the hill may be attacked.

The control of this disease requires a considerable term of years of crop rotation, in the absence of potatoes, for, as far as we know, the disease attacks no other plant. The heavy-celled winter spores resulting from the decay of the infected tuber remain viable and dangerous in the soil for at least six to eight years, the disease having reappeared in European tests on the planting of potatoes in infected soil in which other crop rotation had been practiced for six years. This feature of the disease, and the long period of attention required for its eradication, make it one of the most insidious and dangerous potato pests known to the world.

The introduction and establishment of this disease in America is another case in which we have been criminally negligent in protecting the interests of American agriculture from the inroads of foreign pests by the needless importation of plants from abroad. The United States has shown during the war times that it can be independent of all countries in agriculture, and our carelessness in the past in the protection of our agricultural interests has been almost shameful.



THE POTATO-WART DISEASE.

FIG. 8. A complete hill in badly infected soil.

PROGRESS REPORT ON ROOTSTOCK EXPERIMENT.

By W. L. HOWARD, Berkeley, Cal.

In the spring of 1915 we began testing different rootstocks for deciduous fruit trees at the University Farm. Bartlett pears were planted on French pear and quince stocks; Royal Ann cherries on Mazzard and Mahaleb roots; Robe de Sergent prunes on Myrobalan, peach and almond; Burbank plums on Myrobalan, peach and almond; Drake and Ne Plus Ultra almonds on Myrobalan, peach and almond roots; Royal apricots on Myrobalan, almond, peach and apricot stocks, and Muir and Elberta peaches on peach and almond roots.

All of these trees on the different stocks made a good growth at the outset and at the end of the second year there was no appreciable differences in size as influenced by the rootstocks. The plan of the experiment called for planting from twenty to fifty trees of each variety on the different stocks every year. In the spring of 1917 a set of Bartlett trees was planted on Japanese stocks.

FIG. 9. Trees at right are Bartlett on French stock; on left, same variety on quince stock. All are four years old.

Briefly reviewing all varieties and stocks of different ages from one to four years, it may be said, first, that the Bartlett on quince stock is failing rapidly. Not only are several of the trees gone, but the difference in size of four-year-old trees on quince and French stock is very marked. This agrees with a previous experiment reported in the Monthly Bulletin, Vol. VII, No. 4, page 171, April, 1918. The trees on French roots now average about 10 feet in height and 8½ inches in circumference. (See Fig. 9.) The quince root is supposed to exert a dwarfing influence on trees and is used for that purpose, but it is quite evident that this stock is not congenial for the Bartlett pear. This is not shown so much by the size of the trees as by the lack of vigor and the large number that have died or broken off.

The trees on the Japanese stock show healthy growth, but average a little less than on the French stock. However, the comparison is scarcely a fair one after only two seasons' growth. It should be explained here that the horticultural students planted and pruned all of these trees and naturally they have not received uniform treatment, as too many different men have worked with them.

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It is rather surprising to note that in none of the cherry trees from one to four years of age has the Mahaleb stock exerted any dwarfing influence. The most ardent admirer of the Mazzard as a cherry stock, after viewing these trees, would be forced to admit that they are no better than those on Mahaleb roots. Really there is no difference in the appearance of the two lots of trees. All are in good order and have made a splendid growth.

While there are minor differences among the almond trees on different rootstocks, they are not great enough in any case to be marked. At the end of the third year the Drake particularly was making the best growth on peach stock, but in the absence of exact figures this is not now noticeable to the eye.

The Royal apricot has perhaps shown the best average gain on peach stock. However, all of the trees on the different stocks now seem to the casual observer to be of about the same size and vigor.

The Burbank plum has made the largest percentage of gain on peach stock, but all have made a satisfactory growth.

Of the five different kinds of fruits grown on Myrobalan, peach, almond and apricot stocks, four showed the largest gains for the first year on peach root. In a way this gain for this stock has been maintained, although the differences are now barely noticeable, if they exist at all.

In April, 1917, all of the trees planted that season were given a protective coating of asphaltum, called by the trade S-Flotine. This material was warmed so it could be readily applied with a brush. On the apple trees the material apparently was applied too late to prevent the entrance of borers, from which it was designed to protect the trees. In order that the test might be a severe one, the asphaltum was applied to the trees from top to bottom, all of the buds being covered. There was not a particle of injury to the bark of any of the trees from the asphaltum so far as could be noticed. It was feared that a dark-colored material applied to the bark of trees fully exposed to the sun would be sure to produce a very harmful effect on account of the known characteristic of dark-colored materials to absorb heat. Undoubtedly whitewash or some light-colored material would be a better protection against sunburn. The asphaltum was applied in an extreme way for the purpose of seeing if there would be an unusual amount of sun injury. Since several hundred trees were treated with the asphaltum, it would seem that there is no danger of injury to the bark by using this material as protection against rabbits or borers. However, this year's experience shows that if the material is to keep the borers out, it must be applied very early—just as soon after the trees are planted as possible.

It is expected this experiment will continue for many years. While it was originally intended to let the trees become only five years old before they were taken out and the roots examined, the changed plans call for letting them stand just as long as this particular tract of land is available for tree-growing purposes. After the trees come into bearing, which they will be doing the coming season, there should be more pronounced results as regards their behavior on the different rootstocks.

We still cherish the ambition to start a thorough rootstock experiment where many additional stocks and varieties will be used and on land where they may remain undisturbed for an indefinite period. It is fully realized that an experiment of this kind becomes more and more valuable the older the trees are. Furthermore, a large number of trees on the different stocks should be propagated so that sets may be sent out to different parts of the state in order that we may have information as to their behavior in different soils. However, there should be one complete set all growing under the same conditions, and this should be on state property where they can remain undisturbed for an indefinite period of time. This complete test of rootstocks for deciduous trees will be started just as soon as the proposed deciduous fruit experiment station is established.

WHY PRUNE BEARING APRICOT TREES HEAVILY?

By WARREN P. TUFTS, Berkeley, Cal.

Of all the different species of deciduous fruit trees grown in California, there is probably no other single kind which is pruned by so many and diverse systems as is the apricot. It is the purpose of this article to briefly point out certain pertinent facts regarding the so-called "Winters System" of apricot pruning. The author firmly believes that this system is one which can be improved both from the standpoint of the future usefulness and longevity of the tree, and from the standpoint of greater yields of fruit. It is not intended that this paper shall revolutionize the pruning of apricots and the writer is not at present prepared to definitely recommend the best way of handling full bearing apricot trees. It is hoped, however, that a statement of a few of the underlying facts with regard to the fruiting of apricot trees may be of value to growers of the state.

FIG. 10. Mature full-bearing Royal apricot tree pruned by the "Winters System." Note widespreading horizontal scaffold branches. Photograph taken after annual pruning. Brinck orchard. November, 1918.

Figure 10 shows a typical example of an apricot tree pruned according to the "Winters System." It will be noted that the tree has been constantly trained to a very flat and open head. The annual growth has been cut back severely each year. Practically all the picking and pruning may be done in this thirty-year-old orchard from a six-foot stepladder. Two very serious objections may be raised with regard to this system of training: (1) The upper sides of the scaffold branches are very subject to sunburn, and (2) the heavy annual pruning is repressive in its nature and as a consequence the tree is, to a certain degree, dwarfed; in other words, the possible fruiting area has each year been less than the root system was capable of supporting, as witnessed by the heavy new shoot growth annually produced. (Fig. 11.)

Trees pruned according to the Winters system are, for several reasons, subject to sun-scald of the main branches. The very fact that the greatest extent of the scaffold limbs is at such a flat angle and that consequently the sun has a longer time each day in which to cause injury, often brings about the trouble. In many cases sufficient fruiting wood fails to develop properly to shade these branches, or, if it does develop, is actually cut away in the pruning, thus exposing the tender bark.

FIG. 11. Mature full-bearing Royal apricot tree pruned by "Winters System." Photograph taken previous to annual pruning. Compare Fig. 10 after annual pruning. Not the same tree. Note heavy, luxuriant wood growth forced by heavy annual cutting. Compare wood growth of "long-pruned" tree in Fig. 15. Brinck orchard. November, 1918.

FIG. 12. Nine-year-old Blenheim apricot tree before annual pruning by "Winters System." Note heavy shoot growth forced by severe heading. Compare Fig. 13 after pruning. University orchards, Davis. January, 1916.

Especially during the earlier life of the tree, branches which are flat and carry a load of fruit put a great stress on the upper layers of bark, consequently rendering these parts more susceptible to burn. It has never been proved definitely under California conditions that sunburn does not take place to a certain extent during the winter months, and since it is reasonable to suppose that this may be the case, it would naturally follow that the more exposed the branch when defoliated the greater the scald injury. In the writer's opinion, any one of these reasons is sufficient to cause the grower to abandon a system of pruning which has been followed in practically all cases with severe injury to trees by reducing the fruiting area, the mechanical strength of the branch and the period of productivity. It is only a question of time until wood decay will develop in the parts injured by sunscald and the branches lost to the tree.

Experiments performed by investigators working under different conditions all show that a heavy pruning is repressive of plant growth. Training a tree according

FIG. 13. Nine-year-old Blenheim apricot tree after annual pruning by "Winters System." Compare Fig. 12 before pruning. Note heavy thinning out and heading back of scaffold branches, the horizontal ones chosen in each case. University orchards, Davis. January, 1916.

to the Winters system involves heavy cutting, which of itself is undesirable both from the standpoint of early fruiting and the development of the largest fruiting area consistent with the future productiveness of the tree. The large amount of new wood removed at each annual pruning (compare Fig. 12 and Fig. 13) would seem to indicate that the root system was capable of supporting a larger top, together with its fruit and foliage, than it is now commonly called upon to do. If this new wood were left instead of being largely removed, the stored food materials would be utilized in the production of fruiting wood (Fig. 14-B) rather than in an attempt to again re-establish a balance between root and top (Fig. 14-C).

During the spring of 1916 Mr. August Brinck, of Winters, having considered the matter somewhat as above outlined, decided to experiment with a few rows of thirty-year-old Royal apricot trees by merely thinning out the new growth in about the same degree as in previous years, but *not* heading the branches thus left. This would result practically in building a "second story" on the flat-headed trees, increasing the fruiting area and at the same time shading the main scaffold limbs from sunburn. Figure 15 shows one of the trees in November, 1918, thus pruned in 1916. During the seasons of 1917 and 1918 this tree was pruned by a thinning-out process, cutting back to laterals, but in no case heading the laterals. The annual pruning has been designed to encourage a certain amount of vegetative growth and at the same time allowing sunlight and air to effectively reach the foliage in the lower portions of the tree, keeping such parts healthy and fruitful.

Table I shows the crop for the season of 1918 of comparable trees pruned for three, two and one years by the system above outlined; also the crop from trees receiving the standard heavy thinning-out and heading-back. (Figs. 10, 11.)

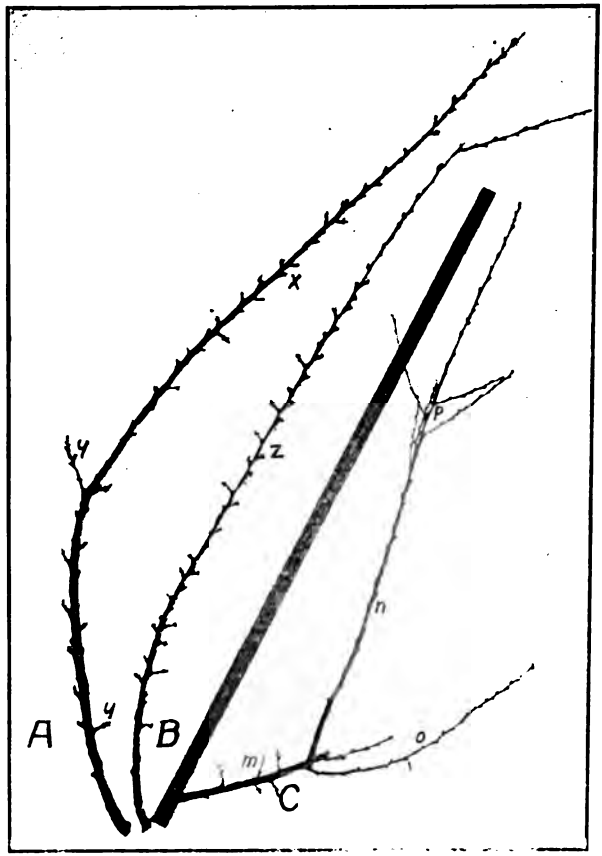

FIG. 14. A. Three-year-old shoot which has not been headed. Note two-year-old spurs at *y*, one-year-old spurs at *x*. B. Two-year-old shoot which has not been headed. Note one-year spurs at *z*. C. One-year shoots arising from two-year wood which was headed at previous pruning developing spurs at *m* and shoots *n* and *o*. Shoot *n* will produce fruit from buds at *p* and below *p* spurs similar to those at *z* in B, if not headed back at pruning.

TABLE I. *Average yield of Royal apricot trees in pounds per tree, Season 1918 Orchard, Winters.*

Pruned by thinning only						Pruned by thinning, heading, star treatmen	
1916-1918		1917-1918		1918			
Total pounds	Number of fruits per pound	Total pounds	Number of fruits per pound	Total pounds	Number of fruits per pound	Total pounds	N fr
515	19	614	15.25	361	15.25	252	
641	16.9	469	16.4			290	
474	14.8					205	
345	16.5					398	
301	15.4					413	
						270	
						198	
						163	
Av. 455.2	16.5	541.5	15.8	361	15.25	278.6	

From the above figures it would seem that the yield can be very materially increased by "long-pruning" the first, second and third years of its practice, above the yield of the trees pruned by the standard method. That the yields just recorded are not an isolated instance reference is here made to results secured by a similar method of pruning in the University Farm Orchards at Davis. These trees, planted in February, 1908, are of the Royal variety and have received identical culture with the exception of the pruning.

FIG. 15. Mature full-bearing Royal apricot tree which up until three seasons ago had been pruned similar to the tree shown in Fig. 10. At last three prunings, has only been thinned out, no heading back. Vegetative growth light (compare Fig. 11), but large amount of fruiting wood. Brinck orchard. November, 1918.

TABLE II. *Comparison of average yields of Royal apricot trees in pounds per tree, Seasons 1915, 1916, 1917, University Orchards, Davis.*

Season	Long pruned	Fruits per pound	Standard (short) pruned	Fruits per pound
1915[1]	178.6		98.25	
1916[2]	49.4	11.3	8.8	7.5
1917	277.9	13.3	120.8	10.9

Trees pruned by the standard method produce their entire crop upon spurs (Fig. 16). It has been the common experience of apricot growers that these spurs can only be depended upon to fruit profitably for three seasons. The first season a tree is long-pruned fruit is produced not only on the spurs, as in the case of the standard pruned trees, but also on the tips of the new wood (Fig. 14-C at *p*). In addition to producing fruit, this one-year wood produces a great abundance of new spurs (Fig. 14-B) for the following season, with the result that the second season this system of pruning is practiced generally witnesses a greater yield than during the summer immediately following the adoption of the method. The third season's crop is likely to be somewhat less than the second, although not necessarily so, because theoretically the spurs formed during the first year are now producing a

[1]No record was kept of size of fruit, although it was noted that fruit from long pruned trees was somewhat smaller but of good marketable size.

[2]Season of 1916 a very poor set of fruit in the University Orchard. Reason not known.

second crop which is not quite so plentiful as the first yield from these sam (Table I) (Fig. 14-A at *y*). That short apricot spurs do produce more th crop is well shown in Fig. 16-A, which shows the scar of fruit produced the summer of 1918 (Fig. 17-A at *x*) and the fruit buds which will bloss the 1919 crop (Fig. 17-A at *y*). Naturally all the spurs which blossom set fruit and as a consequence are at liberty to develop strong buds for the s ing year.

From a study of the fruiting habit of the apricot and of the response th tree makes to heading-back and thinning-out, it would seem desirable to prun

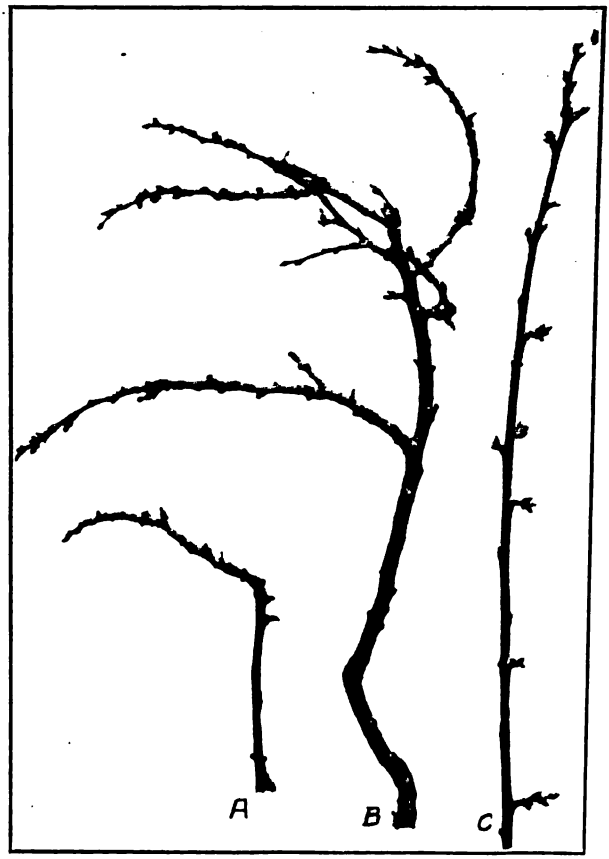

FIG. 16. A and B show apricot spurs which have passed their best productivity. Such spurs are largely depended upon for the bulk of the crop under the "Winters System" of pruning. C shows new slender growth, suitable wood to develop in replacing such spurs as A and B.

ciently severe each year so that a moderate amount of new growth will be obtained which may be retained for fruiting purposes from three to five years and then cut the same away as having served its usefulness and by its removal encourage new growth. On the whole, this means perhaps the removal of a greater number of small branches and old fruiting wood rather than a heavy cutting of new wood as is now the practice.

From the figures above presented it will be noted that the heavier crop was secured by reducing to a certain extent the size of the fruit. If all the fruit is to be shipped a crop of larger size, although of less tonnage, may bring the greatest net returns. As a general rule the trees long-pruned ripen a week to ten days earlier

than those pruned by the standard method. Opening up the tops by the Winters system is supposed to give several days earliness in ripening, but the trees long-pruned ripened as soon, if not somewhat sooner.

In this connection the writer cannot refrain from commenting upon the practice very commonly recommended in the agricultural press of the state of a late summer pruning or early fall pruning to repress luxuriant wood growth and to throw apricot

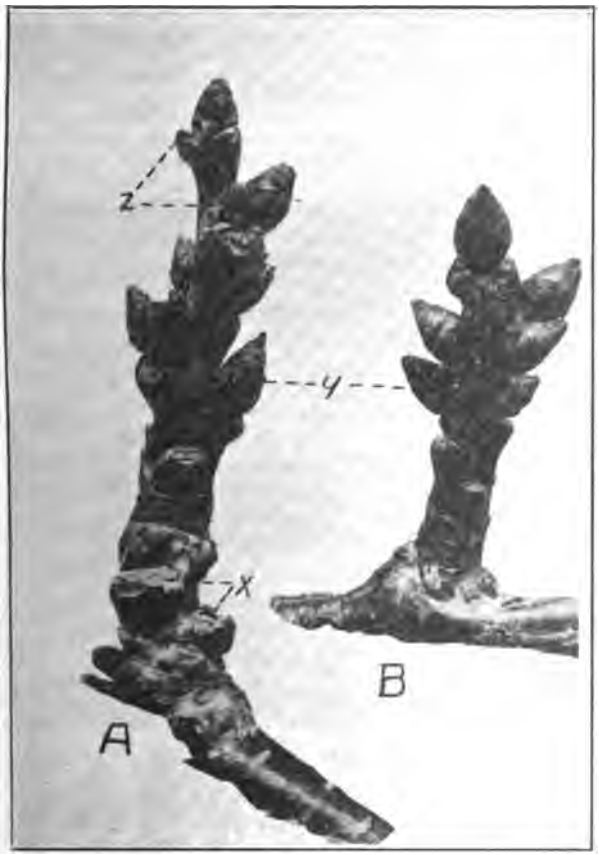

FIG. 17. A. Two-year apricot spur. B. One-year apricot spur. Note fruit scar at *x* of 1918 crop. Fruit buds at *y* are for 1919 crop. Leaf bud at *z*. November, 1918.

trees into bearing. There are certain conditions under which this summer pruning of the apricot may be advisable, but to subdue wood growth and increase fruitfulness in vigorously growing trees the author knows of no better method than a dormant thinning-out process accompanied by no heading.

The fact should be impressed upon the mind of the reader that the experiments of the Division of Pomology of the University of California have not as yet proceeded far enough to warrant the adoption of any specific method of pruning apricot trees. The figures herewith presented are of themselves significant and would seem to indicate that there is a possibility of improving our present systems. Any method which will prevent sunburn of the main branches, stop exuberant wood growth made at the expense of optimum fruit production and yet produce sufficient vegetative growth to insure the continuance of annual fruiting would seem to have everything in its favor as against the present system of heavy pruning followed by sunburned branches and in many cases lighter yields than are necessary or desirable.

MOVIE STARS TRAVEL BY MAIL.

By CHAS. H. VARY, Los Angeles, Cal.

Through the hearty co-operation of Los Angeles postal clerks with the State Horticultural Quarantine office, another package containing injurious insects passing through the United States mails has been intercepted and destroyed. If it was not for the constant care and watchfulness of these clerks and the intensive interest taken by them in endeavoring to meet the requirements of the law, it is reasonable to believe that many infested and infected plants and also injurious live insects would find their way into our state through the mails.

The insects referred to in this instance were nymphal forms of the large Kansas grasshopper, the bodies of many measuring two and three-fourths inches in length. These were shipped by the postmaster of a small town in Kansas to a party in Los

FIG. 18. Nymph forms of grasshoppers ranging from 2¼ to 2¾ inches in length. Above the box in which they arrived. Received through the mails from Kansas, September 14, 1918.

Angeles. The container in which they were placed was a pasteboard box, which upon arrival at destination was in such a dilapidated condition that it would have permitted the escape of the insects had it not been repaired by the mail clerk upon its removal from the mail sack.

The bringing of injurious live insects into the state of California from any other state or foreign country is a violation of "an act relating to the shipment of injurious insects through or into the state of California," effective July 27, 1917. The only exception to this prohibition is in the case of insects admitted for scientific purposes through the United States Department of Agriculture or the State Commission of Horticulture.

This package therefore was held in quarantine by us, the addressee apprised of the facts in the case and notified that the law evidently had been violated and that unless he had previously secured a permit as required the package and its

contents would be denied admittance and disposed of. To our surprise we received a letter from the addressee in which he made the statement that "grasshoppers are the only insects that have some actions resembling human beings and that these were intended to be used in trick photography before the motion picture camera." They were not, therefore, merely common insects as had been supposed, but movie actresses—perhaps future stars in the film world. The truth of his statement was not questioned in the least, nevertheless we failed to be convinced that the grasshoppers were desirable citizens to be at large in California. The addressee also stated that this was an unintentional violation of the law on his part, expressed his regrets that he did not know of the existence of such a law and asked that we destroy the package.

Figure 18 shows the crushed box and a number of the larger specimens of the grasshoppers.

THE CONVERGENT LADYBIRD BEETLE (*Hippodamia convergens* Guerin) AND THE BARLEY-CORN APHIS (*Aphis maidis* Fitch).[1]

[Report of Progress in the Imperial Valley, of California, 1918.]

By W. M. DAVIDSON, U. S. Bureau of Entomology, Deciduous Fruit Insect Investigations, Sacramento, Cal.

INTRODUCTION.

Under the direction of Dr. A. L. Quaintance and in co-operation with the California Horticultural Commission a project embracing the natural control of aphis by the convergent ladybird (*Hippodamia convergens*) (Fig. 19) was started in the Imperial Valley of California in the spring of 1918.

FIG. 19. The convergent ladybird (*Hippodamia convergens*): Adult.

This paper aims to present the results of observations of a single season's work and is a preliminary report. It is expected, if results warrant, that when the investigation is completed a more detailed, monographic paper will be published.

Before the work was undertaken it was intended to make observations and experiments on the natural control of the barley-corn aphis (*Aphis maidis* Fitch) and of the melon or cotton aphis (*Aphis gossypii* Glover) by *Hippodamia convergens*. However, so scarce was the melon or cotton aphis in the spring of 1918 that the work was concentrated upon the barley-corn species.

In the Imperial Valley early barley shows above the ground before Christmas and grain is growing all through the spring until June, when the latest fields ripen, the earliest fields ripening before April. In 1918 every field examined was infested with aphis, and the thicker the stand of grain the heavier was the infestation, noticeably out of proportion to the number of stools over a given area. The grain was first attacked when it was about four or five inches high, a few blades here and there being infested. Later the aphids spread and the size of the colonies grew until at a time when the grain was from 16 to 24 inches high from 70 to 95 per cent of the heads became infested and the colonies averaged about thirty individuals and as many as 150 aphids were present on the most heavily infested heads. As the time for heading out approached the aphids fell off in numbers, the young insects developing wings and forsaking the host, and grain well headed was generally free from aphis. Between the middle of February and the middle of April the aphis was especially abundant on barley. In the spring of 1918, notwithstanding the heaviness of the infestations and rapidity in development of aphis the visible damage to the crop was

[1] Published with permission of the Secretary of Agriculture.

negligible. In some seasons much damage has been suffered. The season of 1918 was one of comparatively even temperatures, the growth of the grain was not checked by meteorological conditions, and there was abundant water for irrigation. These circumstances afforded the growing crop advantages in withstanding the devitalizing action of the aphids. It appears, however, that this happy condition would not detract from the ecological relations between the aphids and the ladybird beetle, and that the observations on this aspect would hold equally good in a year of damage.

Corn is planted in April and May. Very large infestations were observed on this crop in May, 1918, but the heat wave at the beginning of June almost annihilated the aphids and previously the plants had exhibited very little permanent injury.

FIG. 20. Adult ladybirds massing on bush in the sunlight. Such colonies are common in the mountains both before and after hibernation.

OBSERVATIONS ON NATIVE HIPPODAMIA CONVERGENS.

These individuals passed the winter in the valley. They appeared in barley fields in February; except in rare instances only adults were observed during this month, but the few larvæ observed showed that breeding and oviposition began very early in the year and there might have been continuous reproduction throughout the winter, which was very mild. Up to the beginning of April it was possible to observe the habits of these native individuals; after that time, owing to the liberation of imported beetles, it was no longer possible to identify the work of purely "native" individuals.

At no time were the native beetles and their progeny abundant enough seriously to limit the numbers of aphids, not even in the earlier half of April when the larvæ were fairly abundant. Before this the larvæ were scarce and the adults never abundant, although some could be found after diligent search in most grainfields.

Between February 15 and March 29 about 22 acres of infested grain were examined and 113 *Hippodamia convergens* noted, about five to the acre.

The native *convergens* is extremely prolific as evidenced by laboratory observations: thus 8 females averaged 334 ova with a range of from 75 to 1,030. The average period over which eggs were deposited was 32 days, with a range of from 10 to 70 days. These females were collected in the field and it was not certain whether or not they had deposited ova before their capture. As many as 71 ova were deposited in a given day by a single female. Their progeny were found to be healthy and to develop rapidly. Infertile and dead eggs comprised about 13.7 per cent of the whole. In captivity adults and larvæ were fed and readily ate *Aphis maidis*, *Aphis pseudo-brassicae* Davis, *Myzus persicae* Sulzer, and *Macrosiphum pisi* Kaltenbach.

Laboratory experiments in the Imperial Valley showed that the period from egg deposition to adult emergence of the progeny of "native" *convergens* was as follows: During February-March, 30 days; during March, 28 days; during March-April, 25 days; during April, 21 days; during May, 17 days. The majority of the larvæ were fed *Aphis maidis* Fitch; during the early part of the season some were fed *Aphis pseudo-brassicae* Davis, while in May the food used was *Myzus persicae* Sulz. The different aphid species caused no apparent differences in the development of the *convergens* larvæ.

OBSERVATIONS ON THE "IMPORTED" CONVERGENS.

Ladybirds filling about 710 crates (each with approximately 30,000 beetles) were collected in the Sierra foothills in February and March by the State Commission of Horticulture, shipped to Imperial Valley and released between March 6 and April 1. Of these about 60 crates were expropriated for experimental uses.

Shipments arrived in the Imperial Valley from February 18 to the end of March. The later shipments contained a large percentage of dead beetles, but the earlier ones had a very small mortality upon arrival.

On February 18 a number of crates were placed in cold storage in three lots, under temperatures, respectively, of 31°, 43° and 58° F. Under the two lower temperatures the beetles after ten weeks showed a very slight mortality, but after an additional two weeks 80 per cent were found to be dead when the crates were removed. Under 58° F. the mortality was rapid after two weeks confinement.

Laboratory tests in order to compare the "imported" and "native" beetles were carried out, and at intervals beetles were taken out of the crates in cold storage and observed in the laboratory. The presence of sterile females was noticeable, such being 46.4 per cent of the whole. This phase has to be reckoned with in selecting the number of insects to be liberated. It was found that, excluding sterile females, the imported insects were somewhat more prolific than the "native" individuals.

Thus 15 individuals deposited an average of 335 ova, the range being from 3 to 920. The average period over which ova were deposited was 23.4 days, ranging from 1 to 52 days. The larvæ appeared to be as vigorous as those of "native" individuals, while the infertility and mortality of eggs amounted to 15.5 per cent.

Laboratory experiments in the Imperial Valley showed that the period from egg deposition to adult emergence of the progeny of "imported" *convergens* was as follows: During March-April, 25 days; during April, 21 days; during April-May, 18 days; during May, 17 days.

Adults released after a period of six weeks or less in cold storage (31° and 43° F.) functioned in a normal manner and were as beneficial as the "native" individuals, while others released after having been in storage eight or more weeks were much less successful and were impaired bodily.

Observations showed that there was no difference in the prolificacy of native and imported individuals in the second generation, but in neither case were these as prolific as the corresponding first generations.

FIELD EXPERIMENTS.

Field experiments consisted in the liberation and subsequent observation of large numbers of ladybirds furnished by the State Horticultural Commission. The beetles used in the experimental fields had been kept in cold storage, in most cases for over a month, and upon removal from storage were released in the fields. They therefore experienced a decided change of temperature and humidity.

Barley fields in which the aphis infestation was at its zenith and others in which it was at an earlier stage were used for the experiments. Areas were marked off and counts made before and after liberation, to determine both the "native" beetles present and the manner of dispersal and abundance of the liberated beetles.

Without going into detail, the following points were worthy of note: The beetles coming from cold storage, 31° F. and 43° F., when released in the field were mostly sluggish for several days after their liberation; others kept at a temperature of 58° F. when released, began activities immediately. As the question of time is important this feature is to be reckoned with.

The procedure of the beetles was about similar in every field. For two or three days they could be observed within sixty feet of the place where they had been liberated, mostly close by the very spot, so that if they had been released in a mass but few would be found over twenty feet away. After three days fewer and fewer beetles could be recovered and at the end of a week hardly a beetle was visible even if abundant food was present. Moreover, counts made in other parts of the field indicated that but a small percentage, rarely estimated as over 10 per cent, had remained in and dispersed themselves over the field. Sowing the beetles through the field did not appear to have an effect different to releasing them in a mass as borne out by their subsequent dispersal. Thus the futility of trying to confine the liberated beetles to a given area, however heavily infested with aphis, is evident.

The residue, amounting to less than 10 per cent of the released beetles, in time distributed themselves over the field, bred and reproduced normally.

Even when two crates (about 60,000 beetles) were used to an acre this residue was quite unable in the limited time at their disposal to control the aphis.

In the philosophy of the natural control by *Hippodamia convergens*, as with other predaceous coccinellids, it is demonstrable that time must elapse before the maximum benefit can be expected. When we consider that in many of the barley fields observed counts showed that even before the zenith of infestation there were between fifteen and twenty million aphids to each acre, it is obvious that the liberated adult beetles alone could not cope with the situation.

In the Imperial Valley, judging from the capacity for food and reproduction, from the periods of incubation and larval instars, a full month must elapse before the ladybirds are abundant enough to effect control. By this time the earliest beetles of the second generation will be emerging, the majority of the original beetles still feeding, the fertile females ovipositing, and a great number of larvæ at work. It is the numbers of the larvæ that count most in checking a large aphid infestation.

To indicate the rapid progress of the aphids on barley in the Imperial Valley, the writer has seen fields wherein within two weeks the percentage of infested heads rose from 15 to 85 and the average number of aphids per colony increased from 8 to 30. Such outbreaks, by no means uncommon, can in the writer's opinion only be controlled by large numbers of ladybird larvæ reinforcing the labors of the adult beetles.

Although no definite records by marking tests were made regarding the fate of the beetles which abandoned the experimental fields shortly after their liberation, it appeared almost certain that these did not immediately, if at any time, emigrate from the valley. About the end of June large numbers of beetles arrived in the canyons in the mountains west of the valley. Even if these migrated from the valley floor over two months had elapsed since the colonies were liberated in the grain fields.

The Olive in California.

INSECT PESTS OF THE AVOCADO.

I. J. CONDIT, Berkeley, Cal.

The avocado tree in California fortunately has been singularly free from insect pests. Reports from other countries, however, show that this important fruit tree suffers seriously at times from the attacks of various insects. The avocado weevil (*Heilipus lauri* Boh.), which infests the seeds of Mexican type fruits in Mexico, the mealybug (*Pseudococcus nipae* Mask.) and wood-borers (*Xyleborus* spp.) which attack the tree in Hawaii, the fruit fly (*Ceratitis capitata* Wied.) found in ripe fruits in various tropical countries, and a species of Helopeltis, a sucking insect which injures tender nursery plants in the Philippines, are examples to bear out the above statement. The following account of some minor infestations in California should be of interest and may serve to warn avocado growers to be on the lookout for pests which may threaten the success of the new industry.

While visiting some avocado plantings near Saratoga in May, 1918, I noticed a single avocado tree of the Harman variety, on which the tips of some of the branches were wilting and drying up. Closer investigation showed the work of a wood-borer in the axils of many of the leaves. One branch about 18 inches long showed seven openings made by the insect, each in the axil of a leaf, the burrow at one place weakening the branch so that it lopped down. The entrances to the burrows were very conspicuous, as the sap of the avocado tree after exuding becomes flaky or powdery and turns white. Two beetles which were immediately recognized as the twig-borer (*Polycaon confertus* Lec.) (Fig. 21) were captured in the shallow burrows, which were not over an inch deep in any case. Since the tree was small and the burrows numerous, the damage was really serious. Citrus and ornamental trees were in the same yard and may have been infested, although no signs of infestation have been reported by the owner. No cases of infestation were seen on the adjoining places, although there were forty avocado trees planted in orchard form. Obviously, the treatment for such a small tree was to collect and burn the injured branches and inspect the tree frequently thereafter for any new burrows. Should this twig-borer become established in larger avocado trees it might be difficult to combat it successfully. There seems to be little cause for alarm, however, since the species is widely distributed over the state, has a large number of food plants, both wild and cultivated, and appears to cause serious injury only sporadically. This is the second record of the attack of the olive twig-borer on avocado trees, the first having been made by A. A. Brock of Ventura County in the Monthly Bulletin for May and June, 1915. A June beetle (*Serica alternata* Lec.) was found injuring the foliage at Fillmore at the same time.

FIG. 21. Avocado branches are occasionally attacked by the twig-borer (*Polycaon confertus*). The entrances to the burrows are conspicuous on account of the white powdery substance left by the drying of the exuded sap. One branch about 18 inches long showed seven burrows made by the beetle.

In May, 1917, the writer, accompanied by C. W. Beers of Santa Barbara, visited a seedling avocado orchard near Carpinteria. The leaves of many of the trees were found to be badly infested and spotted by a species of thrips (Fig. 22), undoubtedly *Heliothrips haemorrhoidalis* Bouché, mentioned by Essig in "Injurious and Beneficial Insects" as attacking the avocado. I did not have occasion to visit this orchard again until October 30, 1918, when Acting Farm Adviser E. O. Essig of Ventura and myself inspected the trees. We found not only the leaves but the fruit of several trees badly scarred by the thrips, in many cases the scars entirely covering both green and black fruits. Since the fruits were mostly small and suitable only for home use or a local market, the financial loss due to the thrips was practically negligible. No attempts have been made by the owner to control the infestation, although it could probably readily be controlled by the use of a tobacco spray.

FIG. 22. Both fruit and leaves of the avocado are sometimes seriously injured by thrips. The fruit is rendered unsalable on account of the scarred surface and the leaves are so badly discolored, they are unable to function properly. The fruits illustrated are of the Mexican type and were grown at Carpinteria. (Photo by Carl Abell.)

A third pest which the avocado growers of southern California should be prepared to fight is the citrus mealybug. An unthrifty avocado tree near Duarte was found to be infested by the mealybug in July, 1918, and for this and other reasons the tree was later removed. While examining trees and fruit in the same vicinity in October, in the company of Dr. J. Eliot Coit and R. W. Hodgson, it was found that the infestation had spread from the one tree to other avocado trees in neighboring rows. One infested tree was also found in a plot several hundred feet distant from the first tree mentioned. The mealybugs were most plentiful on the fruit-stalks, where in many cases they had collected in masses. They were also abundant on the twigs, in the axils of leaves, and at the forks of the branches. Ants were numerous among the mealybugs and on the trunks of the trees, passing upwards and downwards in a constant stream. The owner of the avocado orchard was thoroughly alive to the situation and will use every available means to control the infestation. No photographs of infested fruit or leaves were secured.

In a letter dated September 21, 1914, Mr. A. A. Brock, Horticultural Commissioner of Ventura County, stated that the mealybug has been a serious pest of the avocado in some districts.

In the 1915 Report of the California Avocado Association the writer mentioned a number of insect pests, among which was an unidentified miner, the galleries of which have been noticed in the bark of tender branches in various parts of southern California. In practically all districts where nurseries or young trees of the avocado have been started with trees purchased from southern California this miner has appeared. It limits its galleries almost entirely to the bark of tender branches and in only one case have I seen it infesting a leaf. Like most miners of this nature, the larvæ work just underneath the outer bark, destroying, however, the cambium layer. The real damage done is slight, resulting simply in a scar along the branch, which eventually disappears as the bark takes on the more mature

gray color. In some cases secondary injury from sunburn or other causes may follow. It would be advisable for growers to remove infested branches and burn them where the removal would not seriously injure the symmetry of the young tree. A similar miner is not uncommon in the rind of oranges, but the species of insect responsible for the work has not to my knowledge been positively identified.

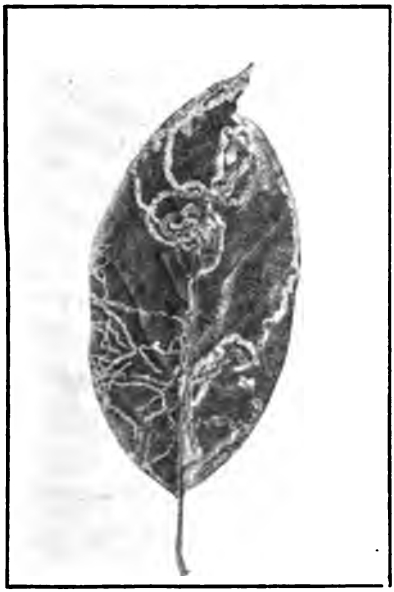

FIG. 23. The work of the miner mentioned in the text is not common in avocado leaves, but is almost entirely confined to the succulent twigs. The galleries are, however, occasionally found on leaves as evidenced by the above specimen. (Photo by Carl Abell.)

FIG. 24. An unidentified miner, which works on succulent avocado twigs, is a common but not serious pest of the tree in California. Its presence is especially noticeable on nursery stock and young orchard trees.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF OCTOBER, 1918.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	71
Passengers arriving from fruit-fly ports	5,023

Horticultural imports:	Parcels
Passed as free from pests	79,805
Fumigated	270
Refused admittance	38
Contraband destroyed	49
Total parcels horticultural imports for the month	80,162

Pests Intercepted.

From Central America:

Pseudococcus spp. and *Aspidiotus cyanophylli* on bananas.

From Chile:

Weevil (undetermined) in cornfodder.

From China:

Lepidopterous larvæ in dried fruit.
Weevil spp. in sweet potatoes.

From Hawaii:

Coccus longulus on betel leaves.
Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.

From Japan:

Lepidopterous larvæ in dry herbs.

From Oregon:

Larvæ of *Anarsia lineatella* in peaches.

From Pennsylvania:

Aphids (undetermined) on Hibiscus.
Chrysomphalus spp. on palms.

From Tahiti:

Euscepes batatæ in sweet potatoes.
Fungus (undetermined) on limes and oranges.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	19
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	153,868
Fumigated	0
Refused admittance	1,005
Contraband destroyed	5
Total parcels horticultural imports for the month	154,878

Pests Intercepted.

From Alabama:
Oospora scabies and Rhizoctonia on potatoes.

From Central America:
Pseudococcus spp. on bananas.

From Florida:
Aspidiotus camelliæ on avocados.

From Idaho:
Leptinotarsa decemlineata and *Hypera postica* in potato cars.

From Iowa:
Sesia rutilans in strawberry plants.

From New Mexico:
Cydia pomonella on apples.

From New York:
Pseudococcus and *Aleyrodes* spp. on gardenias.

From Texas:
Cylas formicarius in yams.

From Virginia:
Balaninus caryatrypes in chestnuts.

From Washington:
Leptothyrium pomi, Lepidosaphes ulmi and *Lecanium corni* on apples.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	11
Fish boats inspected	70
Passengers arriving from fruit-fly ports	32

Horticultural imports:

	Parcels
Passed as free from pests	16,840½
Fumigated	0
Refused admittance	½
Contraband destroyed	1
Total parcels horticultural imports for the month	16,842

Pests Intercepted.

From Central America:
Aspidiotus cyanophylli on bananas.

From Michigan:
Lepidosaphes ulmi on apples.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	3
Passengers arriving from fruit-fly ports	0

Horticultural imports: Parcels None

REPORT FOR THE MONTH OF NOVEMBER 1918.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	71
Passengers arriving from fruit-fly ports	2,480

Horticultural imports:	Parcels
Passed as free from pests	102,487
Fumigated	370
Refused admittance	16
Contraband destroyed	23
Total parcels horticultural imports for the month	102,896
Sterilization (empty containers)	6,028

Pests Intercepted.

From Central America:

Pseudococcus spp. and *Aspidiotus cyanophylli* on bananas.

From China:

Lepidopterous larvæ in dried orange peel.

From Hawaii:

Pseudococcus spp. on green cocoanuts.
Coccus longulus on betel leaves.
Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.

From Holland:

Merodon equestris in bulbs.

From Japan:

Live larvæ of unknown Lepidoptera in cocoons.

From Manila:

Pseudococcus egg-clusters on pot plant.

From Mexico:

Calandra oryzæ in corn.

From Nicaragua:

Weevils (undetermined) in wild cotton bolls.

From Panama:

Phomopsis citri on grapefruit.

From Tahiti:

Larvæ of weevils (undetermined) in sweet potatoes.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	21
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	161,224½
Fumigated	398
Refused admittance	5
Contraband destroyed	13½
Total parcels horticultural imports for the month	161,641

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli and *Chrysomphalus scutiformis* on bananas.

From Hawaii:

Larvæ of *Ceratitis capitata* in coffee berries.

From Holland:

Merodon equestris in narcissus bulbs.

From Idaho:
Cydia pomonella on apples.
Hypera postica on sacks of potatoes in car.

From Michigan:
Larvæ of *Cydia pomonella* on apples.

From Missouri:
Aspidiotus perniciosus on plum trees.

From Washington:
Aspidiotus perniciosus, eggs of Tetranychidæ (undetermined), and *Leptothyrium pomi* on apples.
Venturia pyrina on pears.
Rhizoctonia on potatoes.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	13
Fish boats inspected	60
Passengers arriving from fruit-fly ports	29

Horticultural imports:	Parcels
Passed as free from pests	24,662
Fumigated	4
Refused admittance	7
Contraband destroyed	16
Total parcels horticultural imports for the month	24,689

Pests intercepted.

From Colorado:
Rhizoctonia on potatoes.

From Idaho:
Aleyrodes spp. on *Chimaphila menziesii*.

From Mexico:
Saissetia oleæ and *Coccus hesperidum* on citrus foliage.
Bruchus obtectus in beans.
Chrysomphalus aurantii on sweet limes.
Lepidosaphes beckii on oranges.

From New Jersey:
Aspidiotus spp. on orchids.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	3
Passengers arriving from fruit-fly ports	0

Horticultural imports: Parcels None

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

QUARANTINE ORDER No. 31.

(With regulations.)

Alfalfa Weevil.

The fact has been determined by the State Commissioner of Horticulture that an insect injurious to alfalfa, known as the Alfalfa Weevil (*Hypera postica*), new to and not heretofore prevalent or distributed in the state of California, exists in the state of Utah and in certain counties in the state of Idaho, to wit: Cassia, Bingham, Bear Lake, Oneida, Bannock, Franklin, Power, Payette and Madison, and in certain counties in the state of Wyoming, to wit: Sweetwater, Uinta and Lincoln, and in certain counties in the state of Colorado, to wit: Delta and Gunnison, and that alfalfa hay and other hay and cereal straw, salt grass packing, agricultural emigrant movables, live stock, potatoes, nursery stock, railroad cars and other vehicles are liable to be carriers of the alfalfa weevil into territories otherwise clean of this pest.

Now, therefore, it is declared necessary, in order to prevent the introduction of the alfalfa weevil into the state of California, that a horticultural quarantine be and the same is hereby established at the boundaries of the state of California, in accordance with the provisions of section 2319b of the Political Code of the state of California, against all alfalfa hay and other hay and cereal straw, salt grass packing, agricultural emigrant movables, live stock, potatoes and nursery stock, except as hereinafter provided.

REGULATION 1. Alfalfa hay and other hay and cereal straw that have been grown or stored in the state of Utah or in the counties in the states of Idaho, Wyoming and Colorado aforementioned in this order, are hereby prohibited from entering the state of California for any purpose whatsoever, and upon the arrival of any such hay or straw as quarantined against in this order, the same shall be immediately sent out of the state or destroyed at the option and expense of the owner or owners, his or their responsible agents.

REGULATION 2. The material known locally in the state of Utah as "salt grass packing" shall be admitted into the state of California, provided that each shipment of salt grass packing is accompanied by an official certificate signed by the Crop Pest Inspector of the state of Utah, setting forth that all of the following requirements have been complied with, to wit: That the material in the shipment was cut between the dates of October 1 and April 1; that the raking, shocking, stacking, baling or shipping of this material was not allowed until the maximum daily temperature of the season had fallen below sixty degrees Fahrenheit, and that none of the material in the shipment had been held in the field from one season to another. All shipments of salt grass packing from the state of Utah not accompanied by certificates as herewith provided for, shall be refused admittance into the state of California, and the same shall be immediately sent out of the state or destroyed at the option and expense of the owner or owners, his or their responsible agents.

The use of such salt grass as a packing material in shipments of fruits, crockery and other materials shall be permitted, provided it has been cut and removed from the field between October 1 and April 1, as above specified, and stored in warehouses remote from alfalfa fields, alfalfa hay or other suspected materials.

REGULATION 3. An official certificate signed by the state inspection officer of the state in which the potatoes originate shall accompany all shipments of potatoes grown in or shipped from the aforementioned state and counties into the state of California. Such certificates shall set forth the fact that all potatoes in the shipment have been passed over a screen, placed in fresh, clean sacks and packed in cars that are free from alfalfa hay or other hay or cereal straw. All shipments of potatoes from the aforementioned state and counties, not accompanied by certificates as herewith provided for, shall be refused admittance into the state of California, and the same shall be immediately sent out of the state or destroyed at the option and expense of the owner or owners, his or their responsible agents.

REGULATION 4. All nursery and ornamental stock and other plants imported or brought into the state of California from the aforementioned state and counties must be packed in fresh shavings, excelsior or other suitable packing (except tule, hay or straw), and that each shipment must be accompanied by an official certificate setting forth that each package in the shipment has been fumigated for a period of one hour for alfalfa weevil in an airtight enclosure, subsequent to being boxed, baled or packed for shipment, with cyanide of potassium or sodium at the rate of one ounce to each one hundred cubic feet of space. All shipments of nursery and ornamental stock and other plants as enumerated in this regulation, not accompanied by certificates as herewith provided for, shall be refused admittance into the state of California, and all such shipments shall be immediately sent out of the state or destroyed at the option and expense of the owner or owners, his or their responsible agents.

REGULATION 5. No shipment of household or agricultural emigrant movables originating in any state or county designated as infested by the alfalfa weevil shall be brought into the state of California by any common carrier, person or persons unless such shipment be accompanied by a copy of a sworn statement made in duplicate by the owner or shipper after the following forms, on blanks which will be furnished to applicants by the State Commissioner of Horticulture of California, copy No. 1 to be mailed to the Chief Deputy Quarantine Officer, Room 10, Ferry Building, San Francisco, California, and copy No. 2 to be delivered to the common carrier agent, with a special certificate appended, to attach to the way bill:

STATE OF_____ }
COUNTY OF_____ } ss:

I hereby solemnly swear that I was present during the preparation for shipment of the household or agricultural emigrant movables which this affidavit accompanies; that the goods were delivered to the_____
(Railroad)
at_____ on _____
(Station) (Month, day, year)
constituting (less than) a carload_____
_____
(If carload write initials and car number here)
to be shipped to_____
(Name of consignee)
at_____
(Destination)
via_____
(Give initials of other lines)
that no alfalfa seed, nursery stock, vegetables or fruit is included in the shipment and that no hay, straw or grain is included for packing material or any purpose except as food necessary for live stock in transit to the California state line; that the shipment is made up of the following:
Household goods, farm implements, tools, harness, farm wagons, automobile (draw a line through items not included), stands of bees, live stock_____
(Specify)
feed for animals in transit_____
_____
(Specify kinds and amount of each)
and _____
(Specify any items not included in previous classification)
_____
(Shipper or Owner)

Subscribed and sworn to before me,_____
a Notary Public in and for the state of_____,
county of_____, this_____
day of_____, 19_____.
_____
(Notary Public)
My commission expires_____, 19_____.

The special certificate from the owner or shipper to be appended to copy No. 2 of the sworn statement shall be after the following form:

I hereby agree to observe explicitly the requirements of the California Quarantine Order No. 31 with regard to hay, straw or grain (included as stock feed for use before reaching the California state line), household and agricultural emigrant movables and other materials, and hereby certify that I have mailed this day one copy of the foregoing affidavit to the Chief Deputy Quarantine Officer, Room 10, Ferry Building, San Francisco, California.

_____

(Signature)

REGULATION 6. It shall be the duty of all common carriers to clean and free of alfalfa hay and other hay and cereal straw, all cars or vehicles which have been used for the transportation of live stock in or through any part of the state of Utah or the counties in the states of Idaho, Wyoming and Colorado aforementioned in this order, before the same enter the state of California.

Under the provisions of 2319k of the Political Code of the state of California, violation of the regulations of this order is made a misdemeanor punishable with a fine not to exceed five hundred dollars.

All deputies of the State Commissioner of Horticulture and all State Quarantine Guardians are hereby empowered to carry out all the provisions of this order.

This order supersedes Quarantine Order No. 29, issued December 29, 1916, and Amendment No. 1 to Quarantine Order No. 29.

G. H. HECKE,
State Commissioner of Horticulture.

Approved:

WM. D. STEPHENS,
Governor of the State of California.

Dated: October 15, 1918.

AMENDMENT No. 1 TO QUARANTINE ORDER No. 21.

Pertaining to Citrus White Flies.

The fact has been determined by the State Commissioner of Horticulture that certain conditions of the period make necessary the amending of Quarantine Order No. 21, as follows:

That until further orders dormant nursery stock, of the persimmon and pear varieties, may be removed from the list of prohibited plants enumerated in Quarantine Order No. 21, and the same may be imported into the state of California subject to the following regulations:

REGULATION 1. Persons contemplating the importing or bringing into the state of California dormant nursery stock of the persimmon or pear varieties, from the localities enumerated in Quarantine Order No. 21, shall first make application to the State Commissioner of Horticulture of California for a permit to so do, stating in the application the name and address of the exporter, the locality where the nursery stock was grown, the amount of the importation and the name and address of the importer in the state of California to whom the permit should be sent.

REGULATION 2. All dormant nursery stock, of the persimmon or pear varieties, imported or brought into the state of California from the localities enumerated in Quarantine Order No. 21, not accompanied by a permit to import as provided in Regulation 1, shall be immediately sent out of the state or destroyed at the option and expense of the owner or owners, his or their responsible agents.

All deputies of the State Commissioner of Horticulture and all State Quarantine Guardians are hereby empowered to carry out all the provisions of this amendment.

The foregoing regulation does not apply to the experiments of the United States Department of Agriculture in the State of California.

Quarantine Order No. 21 is hereby amended accordingly.

G. H. HECKE,
State Commissioner of Horticulture

Approved:

WM. D. STEPHENS,
Governor of the State of California.

Dated: November 14, 1918.

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VOLUME VIII

No. 2

MONTHLY BULLETIN

OF THE

STATE COMMISSION OF HORTICULTURE

MOUNT SHASTA.

SACRAMENTO, CALIFORNIA

FEBRUARY, 1919

CONTENTS.

ELLWOOD COOPER

The announcement of the death of Honorable Ellwood Cooper of Santa Barbara County on December 29, 1918, brought a flood of sorrow to his host of California friends, and marks the passing of one of the most notable figures in the horticultural history of this state. Reviewing our acquaintance with the life and actions of this noble man, it is with a feeling of reverence and respect that we offer this small tribute to his memory.

A man of broad, clear vision, of high conception, and a quiet, insistent nature that pursued a purpose to its end, his advent into the horticultural affairs of this state created a turning point in the industry, and laid a solid foundation for that policy of recognition and protection pursued unto this day. Coming to California in 1870, he acquired large holdings and engaged in fruit culture at Santa Barbara. Among his early undertakings were the planting of Eucalyptus and the manufacture of olive oil. As a producer of olives and olive oil he gained a nation-wide reputation, and became recognized as the father of the industry. Mr. Cooper was the author of several works of importance in his particular field of horticulture, but it was his lifelong endeavor to better the conditions of all classes of crop producers that made his name a household word. In 1881 he was appointed a member of the first State Board of Horticultural Commissioners, and continued to serve in that capacity until 1903. When the new act of that year created a Commission of Horticulture he was appointed Commissioner of Horticulture of California and served until 1907, a total period of twenty-seven years' service in this state work. One of the signal issues for which Mr. Cooper fought was the protection of our fruit products against competition with foreign labor and the securing of national pure food legislation which freed the olive from competition with adulterants and substitutes. During this formative period Mr. Cooper's action and interest were ever prominent in matters that pertained to the protection and permanent development of the industry. Largely through his belief in the value and conception of the true purpose of the same, California took the initiative in originating and enforcing horticultural quarantines and, being a producer, he early realized the desirability of a natural method of controlling insect pests. The success attending the original introduction of the natural enemy of the cottony cushion scale, with which he was intimately connected, impressed him to such a degree that a continuance of this policy developed into the paramount purpose of his official life and actions. His pride in the state of California amounted almost to a passion; its ultimate supremacy in horticulture was his creed and, to that end, he consecrated a long, useful and splendid life.

Ellwood Cooper was born in Lancaster County, Pennsylvania, May 24, 1829. In his early manhood he went to Port-au-Prince, Hayti, and became extensively engaged in the steamship business between that point and Philadelphia for a period of ten years. Following this he was in business in New York City for five years, from whence he came to California, residing here until his death occurring at the age of 89.

G. H. HECKE.

GOOD ORCHARD MANAGEMENT.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

Acceptance for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917; authorized August 27, 1918.

Vol. VIII. February, 1919. No. 2

The Advent of the New Season.

The beginning of the new year is accepted generally as the time to sum up the results obtained during the preceding twelve months and to apply the information thus obtained in the furtherance of plans for the year to come. The State Commissioner of Horticulture, therefore, takes this opportunity briefly to report his operations during 1918 and to outline his plans for the future.

Operating under a budget based on prewar needs and conditions it soon was apparent that the activities necessitated by war conditions called for additional funds. To maintain the work already under way, and to bring to a successful conclusion the new projects, transformed by the war almost overnight into important issues, with funds measured by prewar needs, was productive of serious difficulty. That this difficulty eventually was surmounted and that the funds were provided to meet the emergency is due to the active co-operation and assistance of Governor Wm. D. Stephens and the State Board of Control.

One such emergency was presented by the need of uniform statewide efforts to reduce the losses caused by rodents. As a result of the campaign conducted during 1918, the losses caused by these animals have been diminished to such an extent as to lend every encouragement for the further prosecution of the work in 1919.

A branch of the insectary located conveniently at Alhambra for the work of distributing beneficial insects has been established, and beneficial insects have been reared and liberated in infested orchards in such appreciable quantities that the results have been highly gratifying. So marked has been the success of this "quantity" program and so emphatically are the fruit growers voicing their approval of this phase of remedial work that it is hoped during the coming year to extend still further the scope of this division.

Some idea of the appreciative spirit in which this work was received is shown in the action of the Board of Supervisors of Ventura County, who appropriated ample funds at the suggestion of County Horticultural Commissioner Brock to establish a branch insectary for the purpose of rearing beneficial insects at Santa Paula.

While engaged in these activities the welfare of the plant industry of California for the future has been constantly in mind. The demand for California products has been greater than ever before and at the same time the reputation of the state in the world's foreign markets has been maintained, largely through the energetic enforcement of the standardization laws. Of the results obtained along these lines, none has been secured at the expense of the horticultural quarantine work. Never was a time when it was more important to protect ourselves against the introduction of new and dangerous crop pests. It requires only a casual glance at the published reports of the quarantine division clearly to indicate that the standards set for our horticultural quarantine in times of peace have been maintained fully and adequately during the period of war, under stress of a small operating force and extraordinary conditions.

The economic conditions of the past year have been faithfully reflected in the increased cost of operation of every public and private enterprise. The demands of war have produced many emergencies arising in other departments, each calling for additional funds. It has required the most judicious management and the application of rigid economy on the part of the Governor and the Board of Control to meet these many emergencies. With the limited funds at their disposal it has been necessary critically to analyze every such emergency and the fact that the agricultural police work of the state has received such generous support may be attributed only to the importance of the position it occupies as interpreted by those charged with the administration of the state funds.

The State Commissioner of Horticulture is now responsible for the quarantine work, for the rearing and distribution of necessary beneficial insects, for the standardizing of the packing of fresh fruits and for the control of rodent pests. To round out and complete the agricultural police work of the state and to make that work in fact what it is in name there is need now for legislation to bring the control of noxious weeds up to a standard similar to that already reached in the control of rodent pests. Such legislation is now under consideration by the legislature and merits the enthusiastic endorsement of the agricultural interests of the state.

G. H. H.

Official Standards of the United States for Fruits and Vegetables.

Recently there was introduced into the lower house of Congress by Mr. Lever a bill "authorizing the Secretary of Agriculture to establish uniform standards of classification of fruits and vegetables, to provide for the use of such standards in interstate and foreign commerce, to prevent deception in reference thereto and for other purposes."

From the standpoint of those states in the Union where little or nothing has been done to compel the preparation of packages of fruits and vegetables in such a way that they would not be deceptive, this bill, if it should become a law, would, no doubt, serve a good purpose. National grades and nation-wide uniformity would seem desirable, providing that conditions in each state are such that it would be possible to establish and enforce grades and grading rules, which would meet the special needs in each case.

Viewing the situation from the standpoint of California alone, it would seem undesirable to operate at the present time under grades that might be established by the Secretary of Agriculture and to cease operations under our own state standardization laws, which have already meant so much to the fruit industry. We would therefore oppose this bill for the following reasons:

Should the Secretary of Agriculture establish grades which, under the terms of this bill, would be the official grades of the United States, these would apply only in the case of interstate shipments. In 1915 the legislature of California passed our first "Fresh Fruit Standardization Act." That act applied likewise only in the case of shipments of fruit to other states. Because of this fact, it was found to be very difficult to enforce. The packer very frequently does not know when he packs his fruit whether it is to be sold on some of our local markets, or whether it is to be put into the channels of interstate trade. The fresh fruit inspectors, when they attempted to stop the packing of fruit that was not in accordance with the established standards, were met with the statement that the fruit was to be sold within the state. It is absolutely necessary in a state like California, where the fruit industry is of such great importance, that there be just as strict supervision over local shipments as there is in the case of interstate shipments.

It is almost certain that, if this bill should become a law, one of the first fruits that the Secretary of Agriculture would consider in the establishment of grades would be apples, because of the fact that this fruit is grown in practically every state of the Union. Would it be possible for government inspectors to attain as high a degree of efficiency, such as we are attaining at the present time, with the very limited appropriation of $10,000 per annum by the State Commissioner of Horticulture, besides a considerable amount of money by the fifty counties of the state where horticultural commissioners are serving. Again, would it be practical for the State Commissioner of Horticulture to govern the packing of apples for intrastate shipment and to have the government control the packing of apples for interstate shipment?

The appropriation which the Lever bill carries is $250,000. This would mean, if it were distributed equally among all the states of the Union, that there would be approximately $5,000 for the work in each state. This amount expended in California would be inappreciable in comparison with the large amounts that are now being spent for the enforcement of our two standardization laws.

The bill rightfully limits the powers of the Secretary of Agriculture by making it impossible for him to establish uniform standards of classification of fruits and vegetables without giving the public, who are interested in the particular fruits or vegetables, for which standards may be contemplated, a chance to approve of these standards. Notwithstanding the fact that this democratic way of procedure is outlined, the Secretary of Agriculture is given autocratic powers concerning the matter of packages, as the bill states with reference to requirements of certain grades that might be established "that the foregoing requirements shall apply only to closed packages of a kind, which the secretary shall in his regulations under this act find it commercially practical to mark, brand, tag or label in accordance with this section."

At the present time this office is endeavoring to secure the passage of an amendment to our "Fresh Fruit Standardization Law," which will empower the State Commissioner of Horticulture to establish grades and grading rules in a manner similar to the plan outlined, whereby the Secretary of Agriculture is given like powers in the Lever bill. From the standpoint of the work in this state, certainly the plan outlined in our own bill is far more desirable. There must be considerable flexibility in the matter of grades whether they are established for apples or Bermuda onions. Local differences make necessary certain differences in grading rules. Under our proposed act, it would be possible for the State Commissioner of Horticulture to enforce certain grades in one section of California and other grades in another section should there be occasion to do so. On the other hand uniformity when possible is certainly very desirable, and there may be cases where the Secretary of Agriculture could establish nation-wide grades that would apply equally as well in one state as another. The fact remains that should the Lever bill pass—the work along standardization lines, which has been so well organized in California and which at the present time necessitates the expenditure of large sums of money, could not possibly be done as effectively in the beginning at least, in cases where the Secretary of Agriculture should see fit to establish official grades for the United States.

There could be no objection on the part of the fruit interests of this state to a national law, which would make it a misdemeanor to prepare a deceptive pack of fresh fruit, dried fruit or vegetables. Such a law would in no way conflict with the work we are doing at the present time, but in the case of the proposed legislation we foresee numerous conflicts, and it is the opinion of the State Commissioner of Horticulture that the fruit and vegetable interests of California should oppose the Lever bill and work for something that would be of more direct benefit to the California fruit and vegetable industries. Certainly with the tremendous magnitude of these industries in this state, our people should be granted a hearing before this bill is passed by Congress. G. H. H.

Standard Fruit and Vegetable Packages.

Despite the tendency toward standardization in food products and manufactured articles of many kinds, the public is slow to recognize the importance of standard packages for fruits and vegetables. The consumer is vitally interested in being able to secure the best that the orchard, garden and farm can produce, and naturally the produce rather than the package receives his first attention. A closer study of the

condition of fruits and vegetables offered for sale on our markets, than the ordinary consumer makes, will reveal the fact that the container used in packing or shipping very often determines the condition of the fruits or vegetables which so frequently suffer injury during the process of transportation. Shippers of fruits and transportation companies long have recognized the value of properly constructed, properly packed and standard size packages, and the tendency in the future will be to legalize the use of as few sizes as possible, and to prevent the use of those which are unnecessary or undesirable. For practically every fruit at present a number of containers are being used, and no matter how superior the legalized, standard container, there always will be a tendency on the part of some growers and packers to object to it on the ground that there is interference with personal rights in any attempt to compel its use by law. This time-worn argument will not be advanced by the wideawake and up-to-date growers, but by those who are struggling to succeed through the application of old and firmly entrenched methods or customs.

In recognition of the value of standard containers, the legislature of 1917 provided same for grapes, berries and cantaloupes. The wisdom of this step is now recognized by packers and shippers of these fruits everywhere in the state. If any criticism is to be made of the legislative action, it would be that too many different sizes were standardized. With the beginning thus made, further progress is imminent and it is proposed to have the present legislature amend the 1917 act to create, in addition, standard containers for apples, pears, peaches, cherries and apricots.

This move for the good of the fruit industry will be welcomed by the consumer, because of more uniform grades of fruit; by the box maker because it is decidedly to his advantage to manufacture as few sizes as possible; by the fruit grower, who can economize in the storage space of boxes or box material to a maximum degree; by the packer, because too many different sizes always tend toward confusion; by the fruit dealer because he will know just what kind of package he is handling; by the shipper, because there is the greatest economy in the use of car space when standard packages are used; by the industry as a whole, because a combination of all these and other good features with almost a total absence of bad points will encourage a standard pack, greater uniformity in general, and better average prices. G. P. W.

Frozen Orange Situation.

During the first week of the new year a freeze of considerable severity occurred throughout the state of California. South of Tehachapi practically the entire crop of oranges was still on the trees and consequently considerable damage resulted to this crop. It is probable, however, that the injury is not as great as it was first thought to be. A recent investigation by this office in the counties of Los Angeles, Riverside and San Bernardino revealed the fact that injury was more or less local, that is, groves in certain localities escaped with practically no injury while in other places the injury was very severe; in fact certain groves were seen where practically all the fruit was frozen to such an extent that it would not be fit for shipment.

The present Fresh Fruit Standardization Law makes it a misdemeanor to ship, sell or offer for sale frozen oranges, if the reputation of the citrus industry of the state of California would be injured should such fruit be shipped.

Immediately after the freeze, it was necessary for the State Commissioner of Horticulture and the county horticultural commissioners to agree on some standard whereby it would be possible to judge as to whether or not oranges were frozen to the extent of injuring the industry, if shipped. At a meeting of county horticultural commissioners, government officials, representing the Bureau of Chemistry, orange shippers and orange growers, held in Los Angeles on January 16, 1919, it was decided that if 10 per cent of the oranges in any particular shipment showed marked injury in two or more sections, they would be considered unfit for shipment and detrimental to the citrus industry of California, should they be shipped. With this definite understanding of an orange frozen to the extent of being commercially unfit to pack, the county horticultural commissioners of the southern counties are expected to prevent the shipment of frozen fruit. In some counties their efforts have been very successful; in others considerable frozen fruit has been packed. In two packing houses that were visited in a certain county, it was found that fruit was being packed which would run from 45 to 50 per cent frost damaged. There had been no attempt to stop the packing of fruit of this character in these houses. At a conference of fruit shippers, county horticultural commissioners and government officials, in Los Angeles on January 25, a serious complaint was made regarding

the packing of frozen oranges in certain counties, and the shippers placed themselves on record as favoring the enforcement of the law, but they insisted that it be enforced uniformly throughout the state.

This commission, during the rest of the shipping season of oranges, will attempt to bring about the desired uniformity, through field deputies. An effort will be made absolutely to prevent the picking of oranges from groves where injury was so serious that most of the fruit shows the effects of the freeze, until drying of the cells has taken place to such an extent that the water separation process will eliminate most of the frozen fruit.

There are many groves where the injury was so slight that picking should not be interrupted and no packer will be interfered with, unless he insists on picking from groves where injury is serious and 10 per cent of the fruit or more shows frost injury in two or more cells.

We appreciate the co-operation of the Pure Food and Drugs Division of the United States Bureau of Chemistry in the efforts to prevent the sale of frozen oranges and to have an inspection made upon the arrival of shipments which are questionable in the Eastern markets or elsewhere. The inspectors of the Pure Food and Drugs laboratory, operating in various states of the Union, are in a position to examine many such shipments. A report of the condition of the fruit will be made to this office, and even though no arrests should be made we would have something upon which to base our decisions in another season, should frost injury again have to be considered.

G. H. H.

Pure Seed Legislation.

Among the bills introduced at the present session of the legislature are many which are of vital interest to farmers and fruit growers. In fact, judging from the number of agricultural bills, it may be said that the farmer is at last commanding the desired attention of the lawmakers, and that agriculture is coming into its own. I believe we do not overemphasize or boast when we say that California is one of the greatest agricultural factors in the United States. The products of the soil in 1918 totaled over $500,000,000 and the possibilities of expansion may be estimated only by the amount of irrigation water which can be conserved.

California is new; her fields are yet untouched by many of the handicaps to good crops which now cause anxiety to the farmer of the East and Middle West. The soil is still virgin and plant foods unexhausted. The weeds of the Eastern States are rarely found in the grain fields. The pests of crops like corn, alfalfa, cotton and others are still on the eastern side of our great protective mountain boundary.

It would be well during this era of unlimited luxury and abundance to think of the future. The life of a farmer or fruit grower in California today is a paradise compared to the average farmer of the East. Let us continue to keep it so and when legislation of a beneficial nature comes up, give it backing. Pure seeds will prevent the spread of weed pests and will increase the value of farm land and farm crops. The necessity for cleaning seeds apparently adds an additional burden to the grower, but if he will look beyond that burden to the ultimate results, if he can realize the value of high quality in his planting and the protection from dangerous weed pests, which state supervision gives him, he will assume the burden with pleasure, knowing that the end justifies the means.

Pure feeds are also advocated in this legislative session. The importance of this subject is tremendous. California at the present time is the dumping ground for all concentrated feeding stuffs, which are unsalable in other states whose laws prevent the sale of unsatisfactory or inferior products. Pure feeds like pure seeds mean dollars in the pocket at the end of the season. There is no argument against a good law of this type.

We earnestly hope that the farmers and fruit growers of California will not let 1919 go into history without adding to these two vital questions. They stand for standardization—and standardization is the keynote of modern business methods.

O. W. N.

THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VIII FEBRUARY, 1919 No 2

BIENNIAL REPORT OF THE INSECTARY DIVISION, STATE COMMISSION OF HORTICULTURE, 1917-18.

THE CALIFORNIA STATE INSECTARY.

FIG. 25.—"Here are reared the beneficial insects which later are distributed in scale-infested districts of the state."

LETTER OF TRANSMITTAL.

HON. G. H. HECKE,

State Commissioner of Horticulture.

DEAR SIR: Herewith is submitted for your consideration a brief report on the work of the Insectary Division for the past biennium, together with suggestions for future work.

Respectfully,

HARRY S. SMITH,
Superintendent.

The work of the Insectary Division embraces, among other things, the following projects:

I. Introduction of beneficial insects from abroad to help control our insect pests.
II. Work with natural enemies of mealybugs in southern California.
III. Work with the aphis-feeding ladybird, *Hippodamia convergens.*
IV. The citrus white flies in California.
V. The eradication of the snail, *Helix pisana.*
VI. The Agricultural Pest Survey.
VII. The State Board of Horticultural Examiners.
VIII. Miscellaneous Work.

I. INTRODUCTION OF BENEFICIAL INSECTS FROM ABROAD.

Owing to the war and the consequent chaotic condition of shipping not much has been attempted in this line during the biennium. Two expeditions, however, were made to Australia for the purpose of discovering and importing into California natural enemies of the sugar beet leafhopper, *Eutettix tenella*, an insect which, through its connection with the curly-top disease of the sugar beet, has during some seasons caused a damage of well over a million dollars to the sugar industry. These expeditions, while they resulted in adding much to our knowledge of the parasites of leafhoppers in Australia, and while we succeeded in obtaining natural enemies of other California pests which will be worth all the trips cost, did not result in the finding of anything which will alleviate the damage caused by this pest. A number of enemies of leafhoppers were imported into California, but owing to our different climatic and other environmental conditions we were unable to get any of them established. This, though disappointing, is not surprising, since this type of work is always more or less of a gamble, and there will always be several failures to each success. When we consider, however, that if a beneficial insect is once successfully introduced it works day and night for all time and without expense, always for the interest of our agriculture, the state can surely well afford to gamble occasionally on attempts such as this. As a result of these expeditions we have breeding at the Insectary at the present time three different species of natural enemies of the black scale, all of which are promising and much needed.

The legislature of 1917 granted us an appropriation of $6,000 for the purpose of sending an expert to the Mediterranean region of Europe and to South Africa, where we know of a number of valuable parasites of the black scale and mealybugs. On account of the bad shipping conditions, however, we have thought it best not to attempt this work and the fund will be allowed to lapse.

We have been able, at the request of the French government, to supply that country with information on the parasite work as carried on by the Insectary Division, and with plans and specifications of our buildings and breeding equipment. As a result of the success of this work in California, France now has established an insectary modeled after ours and is prosecuting this work vigorously. We have also been able to supply them with colonies of our beneficial insects which they have received in good condition.

We have also supplied the government of Uruguay, through its Consul General in New York, with a colony of *Lestophonus* for use against the cottony cushion scale, and have agreed to furnish them a colony of *Novius cardinalis* as soon as available.

In addition to this foreign work we have shipped colonies of various of our beneficial insects, principally *Novius cardinalis*, *Cryptolæmus montrouzieri*, *Lestophonus iceryiæ*, and *Paraleptomastix* to the states of Florida, Louisiana, Texas and Arizona.

We have been able to help Florida particularly by sending colonies of a whitefly-feeding ladybird, *Delphastus*, which we discovered feeding upon some of our native Aleyrodidæ. We are informed by the Experiment Station of Florida that this ladybird now occurs in tens of thousands in their citrus orchards and that it is doing a remarkable amount of good. In return for this we have received from Florida colonies of *Lætilia coccidivora*, a moth which is predaceous on various kinds of scale insects. This exchange of beneficial insects is of mutual service and should be encouraged, particularly since it costs practically nothing.

We have also obtained from Mr. P. H. Timberlake, of the Hawaiian Sugar Planters' Station, a colony of *Scymnus* sp., an enemy of mealybugs, and he is now preparing for us a shipment of *Pauridia peregrina*, an internal parasite of the Japanese mealybug, *P. krauhniæ*, which has recently broken out in Ventura County.

During the spring of 1918 we received from the U. S. Bureau of Entomology at Melrose Highlands, Mass., two colonies consisting of a total of 1,000 individuals of *Calosoma sycophanta*, a large beetle predaceous on tree-infesting caterpillars of various kinds. This beetle was introduced from France to destroy the gipsy moth and has proved a great success. Since it is particularly valuable against tree-infesting caterpillars it was thought it might prove of value in California. Colonies were released at Angel Island on the forest tent caterpillar, at San Mateo on the California oak moth, and at Sacramento on the brown day moth. It will take some time to determine whether or not the beetle will thrive on our California caterpillars. We have retained in captivity thirty pairs from which to rear further colonies next year.

II. WORK WITH NATURAL ENEMIES OF MEALYBUGS IN SOUTHERN CALIFORNIA.

The work of this division in connection with the control of the citrus-feeding mealybugs by the use of their natural enemies has during the past year met with the greatest success. The establishment of the Southern Branch at Alhambra for the purpose of aiding the citrus growers in the control of mealybugs has brought phenominal results and is everywhere appreciated, and the demand for its continuance and further development is heard on every side. These results could not have been secured except through the enthusiastic backing which I have received from you.

Mr. C. C. Teague, Director of the California Fruit Growers' Exchange, and president and manager of the famous Limoneira Company, one of our most successful citrus growers, writes: "I am more thoroughly convinced than ever of the great effect of this work, and believe that it is possible to obtain parasites that will control most of the injurious insects which prey upon the horticulture and agriculture of the state. The millions of dollars that are spent annually in the control of these insects, and the great loss in fruit and food crops due to them, certainly warrant the state in expending a considerable sum of money in searching for natural enemies and in rearing and distributing those that have already been found to effectively control some of these pests. We have a great example in this community of the possibility of natural enemy control, in the control of the mealybug, which is one of our worst pests."

Mr. E. S. Thatcher, another leading citrus grower, writes: "As we have these enemies to fight the cost of handling them is reduced to an insignificant burden when beneficial insects are found competent, as they have already been in many cases—the Vedalia versus the cottony cushion scale being, up to date, the favorite example. The mealybug control seems to offer an exhibition of success almost as notable and it is certain that progress is being made toward completion in that case. The good that has been done by the State Insectary is doubtless of a value that would make its cost a negligible item, and if it can be supported by further experiment and exploration its services may be indefinitely extended—not to horticulture only but to field agriculture as well, since insects, fungus, etc., are as active on the level as overhead."

These and other letters on file at the Insectary show, not only the need and demand for this work, but the enthusiasm with which it is received.

We have concentrated more or less on certain demonstration orchards and now that it has been shown on a large orchard scale that the mealybug can be controlled by the liberation of large numbers of natural enemies, our problem in the future is to branch out to cover the entire field of mealybug control, at the same time making such improvements in our methods as will render the work still more efficient. The establishment of the Ventura County branch by the fruit growers of that section is a step in this direction, and their willingness to allow their insectary to be operated under our direction is a very gratifying expression of confidence in us. This branch is now occupied and will soon be in full operation.

III. WORK WITH HIPPODAMIA CONVERGENS.

As in the past we have been distributing colonies of the aphis-feeding ladybird, *Hippodamia convergens*, to the farmers and fruit growers of the state. During this season about 75,000,000 of these insects were shipped from the Insectary, mainly to the Imperial Valley for use of grain and cantaloupe growers. At the present time we are carrying on, in co-operation with the United States Bureau of Entomology, a scientific investigation of their work in an effort to obtain a better understanding of its effect from a practical standpoint. The future conduct of this project should be based on the results of this investigation. A report of progress has been submitted by Mr. Davidson and is included in the Monthly Bulletin for January, 1919.

IV. THE CITRUS WHITE FLIES.

I have already submitted to you a report under the above heading, covering the situation as it exists in California at the present time. Conditions with regard to this insect have not of course changed since that report.

V. HELIX PISANA.

The outbreak of this serious snail pest at La Jolla during the past year should be recorded in this report. From time to time it has been mentioned in the monthly reports of this division and I have endeavored to keep you posted on the work of its eradication. I believe Mr. Gorton has the matter well in hand, and its elimination from the fauna of California is in sight. This matter also is included in the issue of the Monthly Bulletin for January, 1919.

VI. THE AGRICULTURAL PEST SURVEY.

The Pest Survey, inaugurated during the past year, has proceeded slowly, but we have completed the survey of the black scale (*Saissetia oleæ*), red scale (*Chrysomphalus aurantii*), yellow scale (*C. citrinus*), purple scale (*Lepidosaphes beckii*), brown apricot scale (*Lecanium corni*), gray citrus scale (*Coccus citricola*), peach root-borer (*Sanninoidea opalescens*), and grape phylloxera (*Phylloxera vastatrix*). Surveys of the four most important mealybugs, *Pseudococcus citri*, *P. citrophilus*, *P. bakeri*, and *P. longispinus* practically have been finished, and maps on the codling moth (*Laspeyresia* [*Carpocapsa*] *pomonella*) and the peach twig-borer (*Anarsia lineatella*) have been sent to the commissioners for data on distribution. In addition we have had made and distributed to the county horticultural commissioners and others forty-one loose-leaf covers for use in filing these maps for future reference.

We are now engaged in making a "key" map which will enable any commissioner to locate at a glance any township in the state, and this will be used when additional records are to be placed on the maps by the commissioners, or when any of them have new records to report. In this way it is hoped to make the maps reflect at all times the latest information on the distribution of important California pests.

VII. BOARD OF HORTICULTURAL EXAMINERS.

During the biennium examinations have been held in thirty-seven counties, a total of seventy-eight candidates, of which fifty-one were successful, trying for eligibility. Below will be found a table giving all information regarding this work for the biennium 1917–1918:

Results of Examinations Held During the Biennium, 1917–1918.

County	Date of examination	Candidates who passed
Glenn	Feb. 10, 1917	C. Hugh Wren, Donald D. Penny, Harold E. Wahlberg.
Imperial	Nov. 3, 1917	None.
Orange	Dec. 18, 1917	Earl L. Morris, E. H. Paddock, Delacourt Kell.
Santa Barbara	Dec. 29, 1917	Hugh Knight, Delacourt Kell, B. L. Boyden, E. S. Kellogg, Joseph D. Neuls, C. C. Staunton.
Yuba	Jan. 5, 1918	None.
Riverside	Jan. 12, 1918	Hugh Knight, Joseph D. Neuls, J. W. Mashmeyer, M. H. Beckwith, Harry Hugh Clendenen.
Sutter	Jan. 12, 1918	Ross W. Knight.
Placer	Jan. 15, 1918	R. W. Schmitt.
Butte	Jan. 19, 1918	R. W. Schmitt.
Modoc	Jan. 26, 1918	Thomas Briles.
Tulare	Feb. 2, 1918	Frank Robert Brann, C. H. Doyle.
Santa Cruz	Feb. 5, 1918	R. W. Schmitt, Donald D. Penny, Carol C. Hopkins, George H. Buhrman.
Los Angeles	Feb. 14, 1918	Hugh Knight, Delacourt Kell, J. W. Mashmeyer, Joseph D. Neuls, Harold J. Ryan.
Nevada	April 10, 1918	(No candidate appeared.)
Stanislaus	April 12, 1918	(No candidate appeared.)
Sacramento	April 15, 1918	Harold M. Van Tassel.
San Joaquin	April 17, 1918	R. W. Schmitt.
Monterey	May 9, 1918	(No candidate appeared.)
Yolo	May 13, 1918	Harold M. Van Tassel.
Madera	May 15, 1918	(No candidate appeared.)
Santa Clara	May 22, 1918	L. R. Cody, F. H. Getchell.
Alameda	May 25, 1918	Thos. O. McClure.
El Dorado	May 28, 1918	J. A. Winkelman.
Sonoma	June 1, 1918	(No candidate appeared.)
Napa	June 3, 1918	Frank Owen, W. D. Butler.
Fresno	June 7, 1918	(No candidate appeared.)
San Diego	June 7, 1918	R. R. McLean, J. W. Mashmeyer, G. R. Gorton.
Calaveras	June 17, 1918	None.
Merced	June 25, 1918	(No candidate appeared.)
Kern	July 19, 1918	Norman G. Buhn.
Amador	July 19, 1918	None.
San Benito	July 25, 1918	(No candidate appeared.)
Solano	July 30, 1918	Frank Owen, G. M. Gates.
Lake	Sept. 27, 1918	(No candidate appeared.)
Colusa	Nov. 1, 1918	R. E. Bouckou.
Shasta	Nov. 29, 1918	B. F. Stroup.
Ventura	April 30, 1918	Fred O. Reed.
	Nov. 29, 1918	A. H. Call.

VIII. MISCELLANEOUS WORK.

Considerable use is made of the Insectary in the determination of pests of agriculture and during the year we have received approximately twelve hundred letters, most of which asked for diagnoses of troubles and remedies for the same. We also have received numerous telephone calls and many personal visits for advice on pest control.

We are attempting to build up a reference collection of the insects of California, an indispensable adjunct to the proper carrying out of the duties of this division. The combination of decrease in assistants with increase in duties during the past year has prevented any extensive work in this line; in fact, we have not been able to care for the material on hand in the best possible way.

In co-operation with Dr. L. O. Howard we have planned a catalogue of the host relations of the entomophagous (or insect-destroying) insects of the world. This when completed will give us valuable information regarding the recorded natural enemies of any insect pest wherever found, and such a work is of fundamental importance in pest control by the biological method. During the past year we have been unable to do our share of the work and consequently most of it has fallen on Doctor Howard's shoulders.

FUTURE WORK OF THE DIVISION.

COLLECTION OF BENEFICIAL INSECTS.

For the purpose of obtaining additional enemies of mealybugs and black scale, it is greatly to be hoped that the legislature will see fit to approve the bill appropriating $6,000 to defray salary and expenses of a collector. There are valuable beneficial insects to be had in Southern Europe and in South Africa. We know positively of the existence of several species of parasites of the black scale which would be of utmost importance to our work against that pest. There occur in South Africa also enemies of a grape-feeding mealybug which should be introduced against our *Pseudococcus bakeri*. Also the recent discovery of the *citrophilus* mealybug in England, the first foreign record of this species, is a possible clue to the finding of its native home and may lead to the discovery of natural enemies which feed upon it, something which is much needed, as it has no specific natural enemies in California. An expedition of this kind, different from most parasite-collecting trips, could hardly be called a venture, because it is certain to result in great value to California agriculture.

THE JAPANESE MEALYBUG.

If the Japanese mealybug, *Pseudococcus krauhniæ*, which has recently broken out in Ventura County, continues to breed and spread, as I believe it will, it probably will equal the *citrophilus* mealybug as a pest of citrus. In case this occurs we should by all means obtain colonies of the many natural enemies which keep it in almost complete subjection in Japan. It would not be necessary to send a collector, since we could employ a native Japanese entomologist at a small figure to do the collecting for us.

CITRUS-FEEDING MEALYBUGS.

It having been successfully demonstrated that our citrus-feeding mealybugs can be controlled by the system now operated by us, our work in the future should be directed toward the production of the greatest number of natural enemies at the lowest cost to the state. This project now emerges from the experimental, and largely from the scientific phase, and enters what might be termed the "commercial phase." Our success in this work will be commensurate with the funds allotted to the project and the efficiency with which such funds are used. It is a branch of our work which shows immediate and very beneficial results and should therefore be liberally supported.

BIOLOGICAL METHOD OF CONTROL FOR BLACK SCALE.

Having successfully demonstrated the value of the biological method of control against the mealybugs, we may now devote our attention to other similar problems. The discovery of the potato-sprout method of breeding mealybugs has made this work possible, and since we have also been able to grow black scale quite as successfully by this method we will next devote our attention to that pest. This work will be undertaken at the State Insectary at Sacramento, for two reasons: First, black scale can not be grown on potato sprouts to advantage if mealybugs are in the same building; second, the work against the black scale will for the present be conducted with a view to controlling that pest on olives and deciduous trees. This method probably would not be practicable on citrus which was also infested with other pests, as the fumigation would make it difficult to carry out. In citrus groves where fumigation is not necessary for other pests, however, it should prove of value. For the present we will work with *Rhizobius*, *Scutellista* and two species of internal parasites working on the half-grown scale, which Mr. Vosler brought from Australia. If we later obtain new species from Europe and South Africa, they too can be utilized in this method. I believe this work against the black scale has as great a future as that against the mealybugs and it should be pushed with all the facilities at our command.

DISTRIBUTION OF BENEFICIAL LADYBIRDS.

Every year the Insectary Division has from 200 to 300 applications for colonies of *Novius cardinalis* which it is unable to fill, owing to the impossibility of getting *Icerya* for food upon which to rear the ladybirds. Through much experimental work during the past season we have found a food plant for growing this scale artificially so that we may have on hand at all times food for colonies of this valuable ladybird. We have finally decided upon the fiber-plant Ramie as the most satisfactory for this purpose and hope to put out several hundred plants during the coming season. It will be a great advantage to the Insectary Division to be able to grow its own supply of *Icerya* for this purpose, since in the past we have had to disappoint many of our growers by being unable to fill their applications.

PEST SURVEY AND HOST CATALOG.

The "Agricultural Pest Survey" and the "Host Catalog of Parasitic and Predaceous Insects" have been going ahead very slowly owing to insufficient office help. Both are important branches of work and should not be delayed more than necessary. Dr. Howard is depending on us to do our share of the catalog and we should not disappoint him, since not only will the catalog be of inestimable value to the work of the Division, but also to the Bureau of Entomology. If we are permitted to employ a stenographer after July 1, as planned in the budget, so that the present stenographer can devote most of her time to these two projects, they will go ahead rapidly.

REFERENCE COLLECTION OF INSECTS.

The reference collection of insects belonging to this division is being sadly neglected, instead of being increased as it should be. A representative collection of insect specimens is a necessity to our work and as soon as possible we should be provided with a cheap assistant who can devote his entire time to collecting, pinning and labeling specimens.

CITRUS WHITE FLIES AND FIG SCALE.

In my opinion the most important problem before the Commissioner of Horticulture at this time, without exception, is the eradication of citrus white flies and the fig scale, and every day's delay is dangerous. Another winter should not go by with these pests left to spread beyond the possibility of extermination.

NURSERY INSPECTION.

One phase of our work which is in need of more attention than it has received in the past is the inspection of nurseries and inspection and treatment of nursery stock. The proposed amendment to the law giving you authority to prevent the shipment of host plants of dangerous pests when such pests are found in a nursery is a big step in advance. If the nurserymen's bill making an appropriation for the purpose of experimental work in fumigation and dipping of nursery stock is approved, that too will be an important factor in the prevention of spread of pests. The development of better methods of disinfecting nursery stock, and better inspection and closer control of nurseries is urgently necessary if we are to effectively prevent the spread of mealybugs, Phylloxera and peach-tree borer throughout the state. Their further distribution will add each year many times the expense of this work to the cost of producing our crops.

CONCLUSION.

In closing this report I can not help but express a feeling of pride in the work of the division for the past season. It has been by far the most successful year in the history of the Insectary, in spite of the handicaps brought on by the war. Of the five male members of the Insectary Division at the outbreak of the war three enlisted voluntarily, and one, Mr. Vosler, has died in the service. Even with the

changes made necessary by the loss of these men we have accomplished results of value, and I want especially to commend the loyal and efficient service of those associated with me, particularly Mr. Armitage, Mr. Branigan and Mrs. Stephens. It goes without saying that your enthusiastic backing and interest in the work is appreciated by us all.

APPLES IN TEHAMA COUNTY.

A well-kept apple orchard at blossoming time.

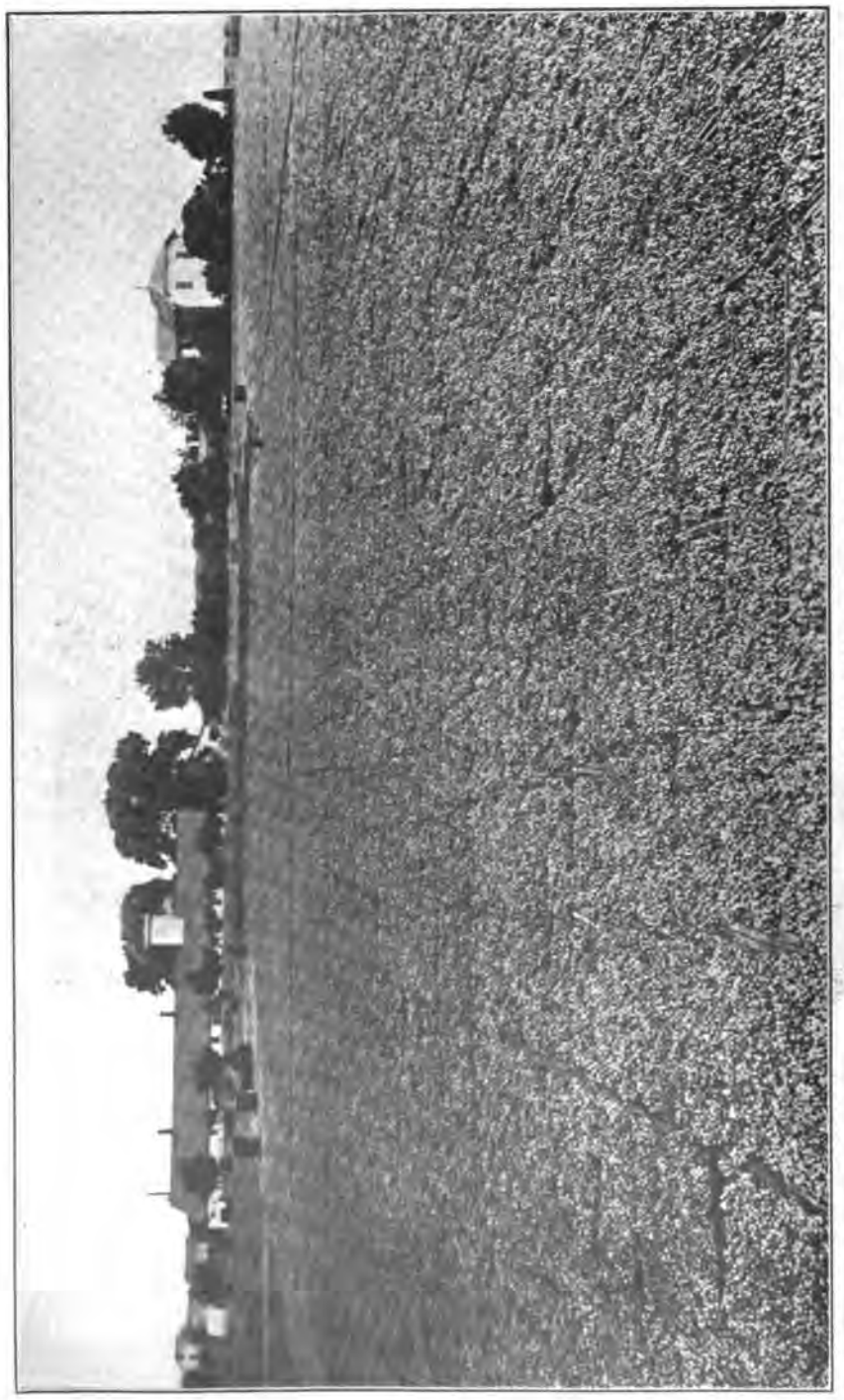

FIG. 26.—Property of California State Commissioner of Horticulture, G. H. Hecke, at Woodland, Yolo County. Dry yard for prunes and grapes, with muscat raisin grapes shown in foreground. Large evaporator, capacity 10,000 trays, in background.

LESSONS FOR PRUNE GROWERS FROM THE SEPTEMBER RAINS.

By W. V. CRUESS, Berkeley, Cal.

INTRODUCTORY.

Under normal conditions, the California prune grower feels independent of the weather and the average fall showers cause him little concern. The heavy rains of last September, however, have caused growers of prunes to seriously consider methods of combating rain damage during the drying season. A study of the weather reports for the last ten years would indicate that fall rains are becoming more frequent and of longer duration than in previous years. This does not mean that conditions during the next decade will be similar to those of the past. Nevertheless, it will pay the grower to study the construction and use of evaporators, and to consider the use of sulfuring as methods of preventing the loss of fruit following a heavy rain.

FAILURE OF USUAL METHODS.

During last September, following the rain of September 12, about three weeks of foggy warm weather occurred which was very favorable to the growth of mold and to the development of fermentation. In most yards the trays were stacked at the beginning of the rain, but the rain continued such a length of time that the prunes in the stack became moist enough for mold growth. Redipping of the fruit did not stop the advance of mold. The turning of the fruit on the trays did little good. In fact, all of the usual methods of overcoming rain damage failed and those who did not use special methods lost a great percentage of the fruit that was on the trays and practically all of the fruit in the orchards. This was especially true of the Santa Clara Valley.

RESULTS OF SULFURING.

It is a well known fact that mold and yeast can not develop in the presence of a certain concentration of sulfurous acid. The amount necessary to prevent the growth of these organisms is very small and very much below the legal limit. Within three days after the rain had started, much of the fruit on the trays had started to develop mold. The presence of the mold was evidenced by the development of black pustule-like growths on the surface of the fruit or by long gray "whiskers" on the fruit and trays, or by the development of the ordinary blue mold and moldy odor and flavor. The last-named mold did the most serious damage. Fermentation was in evidence about a week after the start of the rain. It could be recognized by its peculiar odor and by the development of gas in the fruit. This fermentation was caused by yeast. Where the fruit was not treated immediately on the development of these organisms, the decay continued to such an extent that the fruit became almost worthless. In a number of dry yards the development of this mold was noted in time and the fruit was exposed to the fumes of burning sulfur. Mr. F. R. Shafter of San Jose obtained especially good results with this process. The fruit should be exposed to the fumes of burning sulfur for about two hours, where conditions similar to those in last September exist. Some dry yards used three hours sulfuring, but two hours was in most cases found sufficient. The difficulty that was met was the lack of sufficient sulfuring capacity. Most of the dry yards merely used their apricot sulfuring boxes and these were entirely inadequate to handle the volume of prunes to be treated. It is possible to construct on very short notice a sulfur device known as a sulfur hood. This type of sulfuring arrangement is used in Lake County. It can be simply a light frame covered with building paper or with roofing paper. It should be about one foot longer than the trays, about three inches wider than the trays, and about four or five feet in height. It should have handles at each end in order that two men can lift it and set it down over a stack of trays. Sulfur can be burned in a pan at one end of the hood. Where the trays are stacked to prevent wetting by the rain, these hoods can be used to very good advantage. Should the conditions of September again occur it is strongly advised that all dry yards construct a number of these hoods immediately and begin sulfuring within two days after the rain has

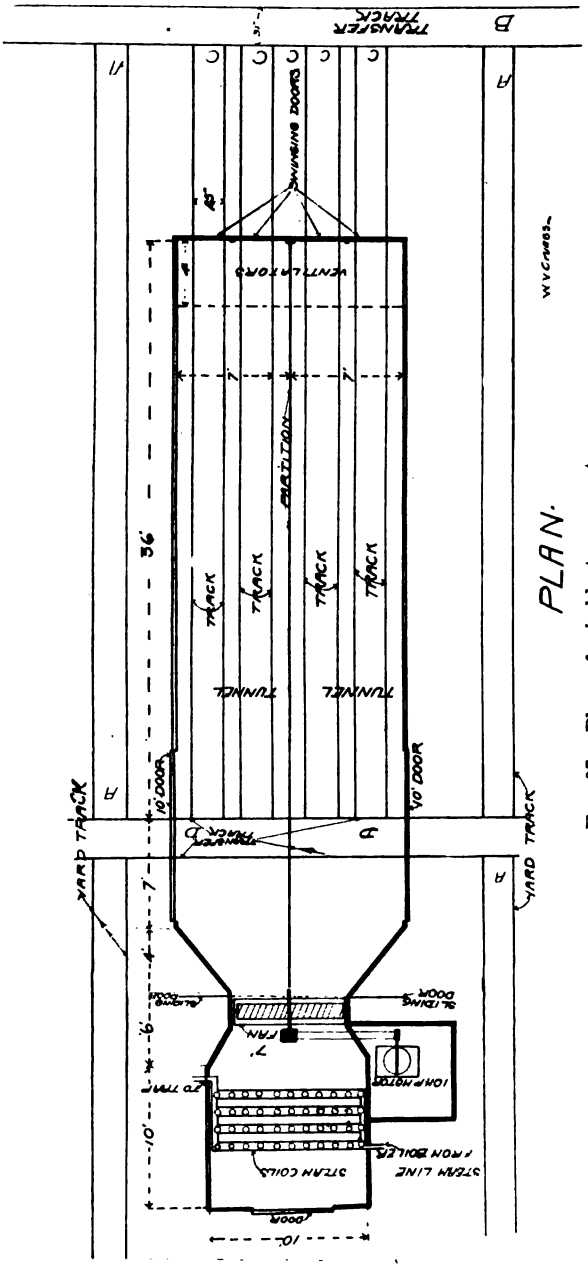

Fig. 27.—Plan of air-blast evaporator.

started. The hoods would not cost more than five dollars apiece and would save many times their value of fruit. The sulfured fruit can then be spread in the yard and dried in the usual way. If the weather continues moist, sulfurous acid will prevent molding and fermentation. When drying weather comes, the sulfured prunes will dry very much more rapidly than will the unsulfured fruit. Fruit fresh from the orchard may be dipped in the usual way and exposed to the fumes of sulfur for two hours. It may then be dried in the usual way. If the fruit is half or two-thirds dry when it is sulfured, there is practically no change in color. If fresh fruit is sulfured, it will be light in color and will make "ruby" fruit. All sulfured prunes will have a tart of plum flavor, but will make a marketable product. Most of the sulfured prunes have found a market, but at a slightly reduced price. However, the sulfured fruit is very much superior to the product which was left on the trays untreated.

ARTIFICIAL EVAPORATORS.

Artificial evaporators may be used in one of two ways. The wet trays and fruit may be placed in the evaporator for a short time merely to dry off the surface of the fruit and to dry out the trays. They may then be placed in the dry yard and finished in the sun. Or, the fruit may be placed in an evaporator and completely dried before it is removed. The two methods may be combined to advantage. A number of different types of evaporators have been studied and the defects of the present forms noted. It has been found that most of the evaporators in use in California have been improperly constructed and do not take into consideration the fundamental principles involved.

The evaporator should provide for a good supply of heat. Many evaporators are lacking in this very essential requirement. A second consideration is to see that the heat is delivered to the evaporator. This means that the furnace or heating system must be equipped with ample radiating surface. Another very important principle is adequate ventilation. The air should move through the evaporator at the rate of six hundred cubic feet per minute or more rapidly. A fourth consideration is to so plan the evaporator that the temperature and ventilation can be accurately controlled. It is believed that the two evaporators described below will answer the requirements of California prune growers. The first evaporator described is rather large in size and is for the use of large dry yards, such as exist in the Santa Clara Valley. The small evaporator would be suitable for the average or small-sized dry yard. It is not claimed that these two evaporators are perfect in design, but they are built on sound principles.

(a) *Air Blast Type of Evaporator*: Essentially, this evaporator consists of two horizontal tunnels, each about forty feet in length, and seven by seven feet in cross section. Each tunnel is equipped with two tracks along which cars of trays may be run. At one end of the evaporator is placed a large fan and heating coils. The hot air is blown over the trays of fruit and escapes through the ventilator at the end. Figures 27 and 28 illustrate the essential features of the dryer. The general dimensions of the dryer can be seen from the data given below:

General Dimensions of Air-Blast Dricr:

(1) Two tunnels 36′ x 7′ x 7′, resting on ground and side by side. (See Figure 27.)
(2) Two sets of ordinary dry yard tracks in each tunnel, 36′ long inside tunnel.
(3) Transfer track in yard 15′ beyond end of tunnels and at right angles to tunnels. (See Figure 27.)
(4) Transfer track connecting tracks inside tunnels to yard tracks parallel to tunnel. This transfer track located 36′ from entrance end of tunnel and 11′ in front of fan. (See Figure 27.)
(5) Folding doors closing ends of tunnels at entrance end of tunnels; two doors to each tunnel, each door 3½′ wide and each pair of doors meeting at center of each tunnel. (See Figure 27.)
(6) Sliding door 10′ long, 7′ high at side of each tunnel at fan end, to permit removal of carload of 8′ x 3′ trays crosswise.
(7) Fan, 6′ disc fan to deliver 35,000 cubic feet of air per minute; 275 R. P. M.
(8) Motor, 8 horsepower.
(9) Air heater, 2,000 feet of 1″ black pipe, built into vertical coils and connected to 40 horsepower boiler and return steam trap. These coils can be bought ready made.

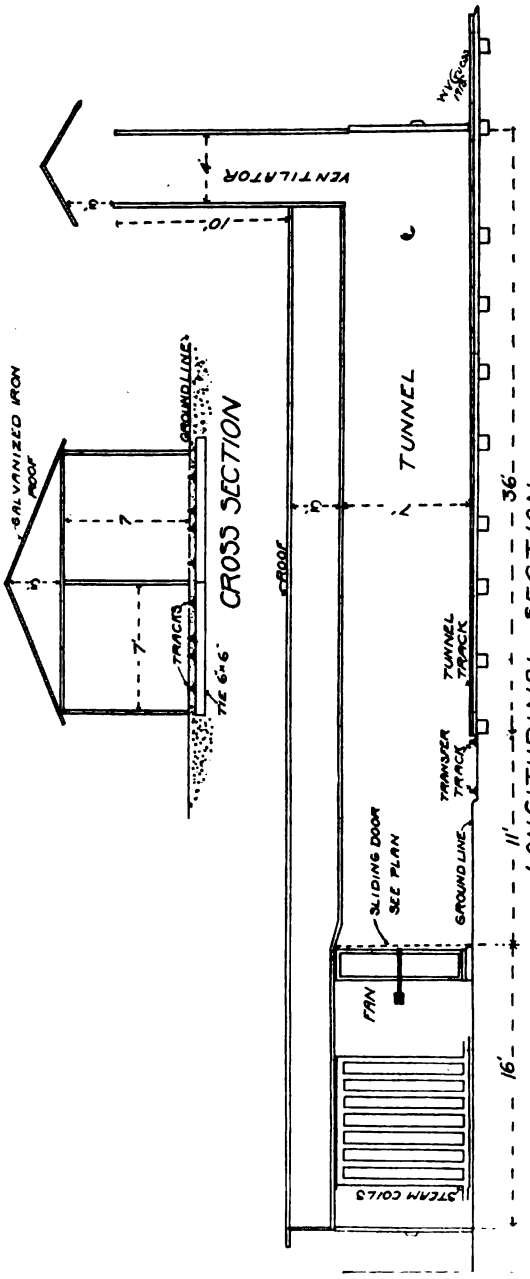

Fig. 28.—Sections of air-blast evaporator.

(10) Alternative Form of Air Heater (would replace coils and boiler). Furnace room 15′ wide, 20′ long, 10′ high, of sheet metal or concrete, tile or brick; an 8′ x 2½′ x 2′ fire brick furnace connected to a system of 300 or more feet of 12″ radiating pipe and smokestack, and equipped with large rotary oil burner.

FIG. 29.—Hot-air dryer near Woodland, Yolo County.

Furnace room to be suitably connected by sheet metal to fan room. Fan room to be of sheet metal or other fireproof material to reduce fire risk.

(11) Roof of rubberoid roofing or of corrugated sheet iron.

In using the evaporator, the fruit is left on the ordinary dry-yard trays which are stacked on dry-yard trucks. The trays should be staggered on the truck and a seven-eighths or inch cross pieces placed between them so that the air can circulate freely over the fruit. The two tunnels are filled with loaded cars, each tunnel holding 8 cars. The fan is started and the air is heated to about 160° F. It is blown over the trays and as the first trucks near the exit of the tunnels become dry they are removed and fresh cars of prunes are entered at the other end. A dryer very similar to the one just described has been used by the West Side Drying Association of San Jose during the past season. (See Figure 33.) It was found possible to dry about two charges of fruit per twenty-four hours, where the fruit was one-half to two-thirds dry when it went into the dryer. At this rate of evaporation, the evaporator would, in a season similar to the past one, soon pay for itself. The cost of evaporation is difficult to estimate. Mr. William O'Brien of the Heilmann-O'Brien Evaporating Company of Marysville has estimated that eighteen dollars a ton per dry ton would cover all of the costs involved in artificial evaporation. A dryer of the above size would take about 320 8′ x 3′ trays at a charge or would handle 640 trays per day if the fruit were one-half or two-thirds dry at the start of operations. The cost of the evaporator, as specified above, would be between $3,000 and $3,500, at present prices of equipment.

FIG. 30.—Upper: Fisher dryer, Napa. Lower: Young dryer, Yountville.

(*b*) *Young Evaporator*: There was recently described in the Pacific Rural Press by J. J. Fox, a small dryer in the Napa Valley. The writer had the pleasure of visiting this dryer several weeks ago and was very favorably impressed with its design and the results obtained. The evaporator was built by the Young Hardware Company of Napa County for Mr. Fred Haas of Yountville, Napa County, at a cost of less than $500. The evaporator will hold at a charge about 80 trays. During

FIG. 31.—A dry yard after September rains.

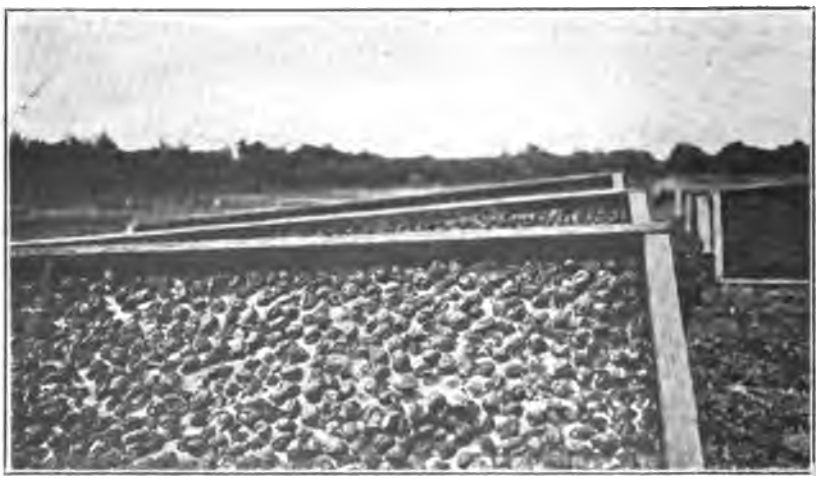

FIG. 32.—Moldy prunes after September rains.

the season Mr. Haas finished about 100 tons of fruit or more than $10,000 worth. That the dryer was a paying proposition is evident. The evaporator is a modified stack evaporator, consisting of a fire pit and four stacks or cabinets directly above the pit. The fire pit consists of an excavation about two feet deep, fifteen feet long, and nine feet wide. It has six-inch concrete walls four feet above the ground and two feet below the ground. It is equipped with a distillate burner and with six lengths of nine-inch radiating pipe and a nine-foot drum, two feet in diameter. These pipes are led back and forth across the drying pit, with a general upward slope from the furnace to the smokestack. There is about seventy-five feet of

radiating pipe in all. The dryer chamber is built with double walls and rests directly on the walls of the fire pit. The walls of the dryer proper are seven feet in height and the other dimensions of the dryer are the same as for the fire pit. There are four drying compartments. Each compartment is nine feet by three feet, and seven feet tall. Each compartment is equipped with runways for fifteen trays. This places the trays about five inches apart on center. The bottoms of the drying compartments are open over the pit. The tops of the compartments connect with a small ventilator. Each compartment has a swinging door seven feet by three feet. The evaporator will handle two charges of fruit per twenty-four hours. About twenty-five to thirty gallons of stove oil is used in the burner for each twenty-four hour period. Two men are necessary to handle the trays. It was found necessary to hang over the radiating pipes a strip of sheet metal about four feet wide to deflect or break up the current of hot air in order to give even distribution. In operating the dryer another season, the owner believes that he would use wire screen trays. Wire screen trays would permit better circulation of the air and would result in more rapid and uniform drying. Because this evaporator is so low in price and because it has given such satisfactory results, it is probable that it will be used very widely throughout the prune-growing sections. A similar evaporator was built for William Fisher of Union Station, Napa County. In Figure 30 the general appearance of these two evaporators may be seen.

SORTING FERMENTED PRUNES.

A number of dry yards allowed prunes to remain on the trays and permitted them to dry without treatment. Some of the fruit paid for sorting, but there was serious difficulty met in recognizing fermented prunes. Experiments showed, however, that the fermented prunes would float and that the sound prunes would sink in water. A sharper separation was obtained by using a 5 per cent salt solution or a 10 per cent glucose solution. By use of ordinary brine-dipping vats, it should be possible to sort the fermented from the sound fruit very rapidly.

UTILIZATION OF DAMAGED PRUNES.

Fermentation tests and analyses were made at the University to determine the value of damaged prunes for alcohol manufacture. It was found that the average

FIG. 33.—Air-blast type of evaporator of West Side Drying Association, Cupertino.

damaged fruit would yield about twenty-five dollars' worth of material, but the alcohol factories could not be interested in this fruit, and where it could be used would not offer more than five dollars per ton. This would not pay the grower to haul it to the factory. The fruit would yield about fifty dollars' worth of vinegar, or about the same value of acetic acid or acetone. Unfortunately, however, there is only a limited market for these products. It probably would not pay to manufacture them.

The fruit was fed to hogs by a number of growers. It was also used by Professor Jaffa in some feeding experiments. The hogs gained rapidly on prunes, but it was stated that the flesh from prune-fed hogs possessed a disagreeable odor and flavor which was very noticeable during cooking. However, this feature could

be overcome by finishing the hogs on grain. Experiments were made on the making of syrup from the damaged fruit. It was found that the fruit could be boiled with water, pressed, the juice clarified by filtration through infusorial earth, the acid reduced by the addition of precipitated chalk, and the filtered juice concentrated in a vacuum pan to a heavy syrup. The syrup was dark in color and fairly pleasing in flavor. During the shortage of syrups and sugar this product might find a market. At seventy-five cents per gallon, about sixty dollars' worth of syrup can be obtained from a ton of the fruit.

SUMMARY AND CONCLUSIONS.

(1) The heavy rains of last September followed by a long period of warm, moist weather resulted in an enormous loss of prunes. The usual methods of handling wet prunes failed because of the adverse weather conditions.

(2) Sulfuring of this fruit by exposing it on trays to the fumes of burning sulfur for two hours thoroughly checked molding and fermentation and made it possible to dry the fruit satisfactorily. The sulfured product was excellent in flavor and appearance and has found a market. All prune dry yards should provide themselves with adequate sulfuring apparatus to meet any emergency such as that of September, 1918.

(3) Artificial evaporators were used to good advantage in a number of yards but most of the evaporators were inefficient and expensive to operate on account of their improper design. Two evaporators have been described and it is thought that these will fulfill the needs of California dry yards. Many other styles have been studied and descriptions and specifications for one of these can be given by the University on request.

(4) Fermented dried prunes can be separated from the sound fruit by flotation in water in a 5 per cent salt solution or 10 per cent glucose solution.

(5) The least damaged fruit can be utilized for alcohol, acetic acid, and acetone manufacture, but under existing conditions this method of utilization will probably not be profitable. Their use for hog feed is probably the most satisfactory method of disposing of them. A good syrup can be made from the damaged fruit, but it is doubtful if this could be sold in competition under normal conditions with corn or other cheap syrups.

THE "WINTERS SYSTEM" OF PRUNING AS ADAPTED TO PRUNES IN CALIFORNIA.

"DIE-BACK" OF THE FIG IN CALIFORNIA.

By I. J. CONDIT and H. J. STEVENS.

INTRODUCTORY.

Within the last two or three years, reports have been made in California of a peculiar die-back of the fig tree which manifests itself particularly in the spring as the young shoots begin to push out. During the spring of 1916 this condition was quite noticeable in various orchards near Fresno and Merced as well as in Los Angeles County. The young buds start out in the normal way, often produce leaves and perhaps small figs, and then without any apparent cause the leaves wilt and dry up very much as if they had been burned. Upon examining the limbs closely small tufts or pustules of a fungus can be seen encircling the limb just below the new growth on the older wood. In other cases, however, no fruiting bodies can be seen from the outside but the texture of the bark is somewhat softened and sometimes takes on a shredded appearance.

When the limbs first described are split longitudinally a distinct darkened and discolored area is present at the point where the sporulating pustules were found. Above and below this point healthy tissues are discovered. The bark and inner tissues seem to be killed in this area only, and the portion above, though not diseased, eventually dies. The whole dead branch dries out and becomes very hard and brittle with the bark closely attached.

The second form, where no fruiting bodies can be seen on the outside of the limbs, shows, when split open, a decided shrinking of the pith and the presence of sclerotia of various shapes and sizes. These sclerotia range in size from a very small pea, to a body twelve to fifteen mm. in length and five or six mm. in width. They are sometimes found underneath the bark. It often occurs that the tips of limbs so affected can not start in the spring, already having been killed in the fall or winter. The appearance of this form is very distinct and can not be confused with the above when once recognized. The bark becomes softened and shredded, flaking off and exposing the wood. The inner tissues are softened and become pithy in texture.

FIG. 34.—The black sclerotia form the resting stage of this fungus and are conspicuous in contrast with the white pith. Note the characteristic "shreddy" condition of the bark. (Photo by Abell.)

Upon examining carefully these two conditions, both in the field and in the laboratory, it has been ascertained that the die-back accompanied by the sporulating pustules on the outside is caused by the fungus Botrytis, probably *Botrytis cinerea* Pers. The second or sclerotial form is caused by a Sclerotinia, probably *Sclerotinia libertiana*. Though they are often found on the same tree, these two fungi are undoubtedly distinct and must be treated separately.

BOTRYTIS.

It has been known for many years that *Botrytis cinerea* is the cause of many of our common fruit rots. It has been found on the lemon, strawberry, fig, grape and other fruits.

FIG. 35.—Fig branches become infected with Botrytis from the fruit which hangs on the tree during the fall and falls to develop. Stages of the disease may be found in which the upper as well as the lower part of the branch is still alive and ready to grow, although the infected part is dead. The fruiting patches of the fungus readily can be seen.

Reports of the presence of this fungus on the fig have been made from time to time from localities covering almost the entire state. In 1914 its presence was noted by the late William Wood, County Horticultural Commissioner, Los Angeles County. He stated that more than twenty-five complaints of this disease came to his office in June, 1917. Speaking at that time in reference to this fungus, Mr. Wood said, "I have known of it (Botrytis) for over twenty years and while it is found most anywhere in Los Angeles County, so far it only attacks a tree here and there. The White Adriatic, White Pacific, and Kadota are the most susceptible to it. In all cases I have known, it has killed the tree in two or three years."

This is the only instance where the disease has even been reported as doing any severe damage to the tree. It is quite surprising that any tree actually should have been killed by it. It seems more likely that the tree, slightly weakened by Botrytis, was rendered more susceptible to sunburn and to the attacks of other diseases which later caused its destruction.

Other localities in the state, where Botrytis has been observed, are Fresno, Merced, Berkeley, Hayward, Davis, and Santa Clara. Very likely it occurs in all sections where the fig is grown, and in all probability further observations will substantiate this supposition.

INFECTION.

Just how the fungus enters the fig limb has not been thoroughly worked out. However, all field observations indicate that infection starts in the fruit, and the mycelium, after thoroughly penetrating the fig, works its way down into the wood. At this point it comes to the surface and produces many tufts of conidiophores. It does not seem to continue its ravages down the limb the next season, but remains local, killing that portion only.

Specimens have been gathered from nearly all sections of the state and all produce the characteristic growth of *Botrytis cinerea* when grown in culture media. It has been observed that neglected trees which are not especially vigorous have many mummied fruits which hang over the winter and the twigs show considerable die-back in the spring. Other trees having no dead fruit hanging over, are free from the disease in all cases. This in itself is a very strong indication that infection takes place through the fruit, though it is very probable also that any injury in the twigs would open the way for infection by wind-borne spores.

As early as 1903, a Botrytis disease of fig trees was reported in southwestern France by A. Prunet as killing the young branches. He stated that it developed in the immature fruits hanging on the trees over winter, and, with the mild weather of spring, became active, traveling down into the branches and killing them.

Brierly (1916) investigated a disease of the fig tree in England due to *Botrytis cinerea*, which he says is one of the most common troubles of the fig in that country. He refers to Massee (1910) who states that during the ripening season, figs exude a sweet liquid through the apical pore of the fruit. In this liquid Botrytis spores germinate very readily and soon travel into the soft tissues of the fig. Brierly found dead shoots bearing pustules of Botrytis conidiophores. Cultures were made and after a varying period of time abundant sclerotia were formed. Mummified fruits which hang on the tree over winter give rise in the spring and early summer to conidiophores arising in clusters from irregular sclerotial masses

of hyphæ, the sclerotia being greyish-black, soft, and cheese-like in texture. No sclerotia were reported in the twigs.

Growth in Pure Cultures: In pure cultures, it has been found by the junior author that conidiophores are produced within eight to ten days in either prune or plain nutrient agar. The mycelium first grows very rapidly, completely covering the bottom of the petrie dish in less than twelve days. The conidiophores, which have already started to form, soon give it a greyish black color, characteristic of Botrytis. Thinking perhaps that the two die-backs might be caused by the same fungus, and that the sclerotia found in the twigs might possibly be another form of *Botrytis cinerea*, numerous transfers have been made using different media, but no sclerotia have been produced. These experiments, however, are still in progress.

SCLEROTINIA LIBERTIANA.

Very little is known regarding this phase of the die-back. Our attention was first called to the disease in May, 1916, when specimens were forwarded by the Roeding Fig and Olive Company, Fresno, with the statement that it appeared to be on trees all over the country, especially on dry land. At that time the cause of the injury was assigned to frost, as the sclerotia were not noticed. The fungus origin of the disease was not determined until June of the same season when the attention of the senior author was called to the black sclerotia in the pith by a grower at Merced. It is not as common nor as serious as Botrytis in the coastal regions, but is probably more prevalent in the interior valleys where there is more frost. It has been found near Merced, Fresno, Modesto, Sultana, Davis, Elk Grove, Yuba City, Monroeville, and Santa Clara. Observations have shown that it occurs oftener during wet, cold winters, especially following frost damage. No damage was reported during 1918, probably due to the mild winter which tended to create unfavorable conditions for the spread of the disease. As a result no newly-formed sclerotia have been found. The material which has been used in the laboratory was obtained from branches killed a year or more ago.

Infection: How this fungus first gets a foothold as a parasite is more of a problem than with Botrytis. It seems a very plausible theory, however, that following frost damage, the tips of the limbs are weakened and become more susceptible to the attacks of fungi. During the cold, damp days following, apothecia may be formed from sclerotia lying in dead twigs on the tree or on the ground and spores set free which easily could be blown about by the wind onto the leaves and twigs. It is not definitely known that the species found on the fig, is the same as that found on the lemon, bean, cucumber, etc., but it is very likely that there are other hosts near by from which infection may take place.

Growth in Pure Cultures: The sclerotia germinate well in both plain nutrient, and prune agar, producing a dense, snow-white mass of mycelium within a week. Within nine days small sclerotia can be seen forming and it is but a short while before the characteristic dark-colored sclerotia of *Sclerotinia libertiana* are well formed. Careful examination of the hyphæ and the method of growth point very strongly to *Sclerotinia libertiana* as the fungus. Many transfers have been made in an effort to learn if by any chance this form could be the sclerotial stage of *Botrytis cinerea*, but each time only the snow-white mycelium is produced, developing bead-like sclerotia in the course of nine or ten days. These sclerotia measure three or four millimeters in diameter.

DAMAGE DONE BY THE TWO FUNGI AND THEIR CONTROL.

Unusually cold and moist weather is to a large extent essential to the development of *Sclerotinia libertiana*. Consequently this fungus becomes of less significance than Botrytis under Californian conditions. Neither, as yet, however, may be considered as producing a real economic problem. The control measures which suggest themselves are to destroy mummified figs during the winter and keep the diseased twigs pruned out.

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OAK-FUNGUS DISEASE, OAK-ROOT FUNGUS DISEASE, FUNGUS ROOT-ROT, TOADSTOOL ROOT-ROT OR MUSHROOM ROOT-ROT.

By W. T. HORNE, Berkeley, Cal.

One of the most widespread and injurious fungi in the Pacific coast region is that known as oak-root fungus or *Armillaria mellea*, more recently called *Armillaria putrida*. This fungus is one which infects various kinds of roots or wood lying in the soil, causing wood rot. It attacks living trees or shrubs and causes their death. Affected trees or shrubs usually show a certain amount of distress before they suddenly collapse and die during dry weather. Sometimes a tree dies suddenly, without previous symptoms, and sometimes an attacked tree lingers along making a certain amount of recovery but finally succumbs. From the behavior of such trees it would not be possible to distinguish between this trouble and certain others, such as gopher injury, root sour-sap, etc.

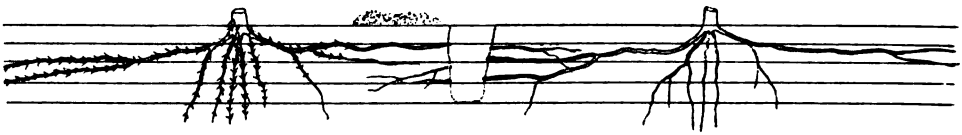

FIG. 36.—Diagram showing condition of roots of almond trees in deep soil down to four feet. Some roots extend many feet beyond those shown, but they are widely scattered and it is believed the fungus will pass very slowly from one to the other and in many cases not at all. Arrows indicate presence and probable direction of growth of Armillaria. Effect of ditch in separating the root systems is shown. In shallow soils and with smaller trees the separation will be even more perfect.

In orchards the fungus usually develops from a center, spreading outward from one tree to another year after year, so that in time extensive areas become killed out. Trees replanted within the affected area ordinarily die within a few years. This behavior is highly characteristic but some instances have been found where local water injury causes the same phenomena. Trees affected with oak fungus, when examined at the root, show characteristic symptoms.

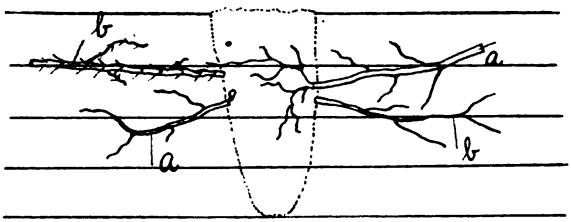

FIG. 37.—An observed condition where orange trees were protected by a filled in ditch. At *b* a piece of diseased root was returned by mistake. At two years infection had spread to the root on the healthy side of the ditch but was removed at a safe time; *c* are new roots formed before the cut end of root *a* became diseased.

Rhizomorphs are purplish brown, cord-like bodies which grow out from the rotted wood which is filled with this fungus. They may grow for several yards through loose soil, but the length is rather limited, especially in firm soil. They resemble roots but are smooth and shiny and branch in a different manner. If a rhizomorph is twisted in the fingers it is found to be composed of an outer, brittle shell and a light-colored tow-like center, whereas a true root has a woody core. A rhizomorph is really a bundle of fungus threads, the outer layer of which has become hardened into a shell. When the tip of the growing rhizomorph comes in contact with a susceptible root the threads of the rhizomorph penetrate the root and spread out below the surface into white fan-shaped mycelium which causes the rapid death of the invaded part of the bark. If conditions are not very favorable for their development rhizomorphs may not be found, so that they are not always present.

WHITE FAN-SHAPED MYCELIUM.

When a root attacked by oak fungus disease is examined by cutting into the bark, the whole substance is found invaded by white or creamy mycelium in the form of large, conspicuous plaques and the normal consistency is entirely changed, being first watery and then soft and decaying. There is often associated with this a gelatinous or gummy material, and in many of the affected trees the margin of the invaded bark gums copiously. The odor of this decayed bark is not sour or putrid but has a sharp, rather agreeable, mushroom smell. This white mycelium is an invariable sign of the disease. Where a tree is killed by some other agent, different kinds of white fungi may invade the bark and form felty mycelium so that sometimes considerable skill is required to recognize the Armillaria mycelium with certainty. The white mycelium of Armillaria is never found in nature on the surface of the bark but always buried, since if the mycelium comes in contact with the air while it is alive it covers itself with a brown coat or shell.

WOOD DECAY.

The white mycelium also penetrates copiously into the sound wood. At the outer limits of penetration the wood is slightly darker than normal, but the fungus rapidly causes the wood to become decayed with a uniform white rotting. Rapidly decaying wood or bark when exposed in the dark shows phosphorescence. Unlike other wood rotting fungi, Armillaria mycelium is killed by thorough drying out.

SPOROPHORES.

The spores of the oak-root fungus or Armillaria are produced on toadstools or mushrooms, which come in large clusters from fungus-invaded wood. They have not been found in California except in the period from October to February. The toadstools are light tan color on the top, varying considerably according to the dryness of the atmosphere, usually with tiny brown scales on the top. The lower surface of the toadstool is white or dull white and produces spores which can often be seen below the toadstool as a white powder spread over the ground. On the stalk below the top or cap of the toadstool is a delicate ring. The spores which

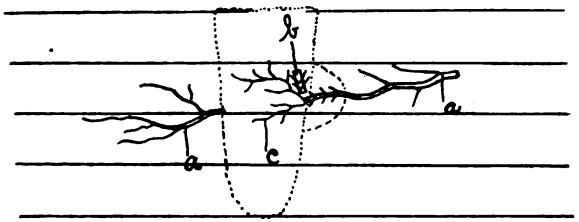

FIG. 38.—Same experiment as Fig. 37. Root *b* on the diseased side was healthy where cut by the ditch, but now the disease has progressed to the ditch. The outer end of root *b* on the healthy side of the ditch remains unaffected and still living after two years. Root *a* on the healthy side of the ditch remains healthy but has sent new roots near to the diseased root *b* on the opposite side of the ditch, showing that the ditch must be left open or reopened. The outer end of root *a* where cut by the ditch is still alive and sending up the beginnings of a shoot.

make up the powder beneath the toadstools are capable of growing and reproducing the fungus, but apparently there is no danger from those spores attacking living plants. They probably become established in rotting stumps or similar situations, so that ordinarily there will be no particular advantage in attempting to destroy the toadstools. When young and tender these toadstools or mushrooms are edible and are said to be fairly good in quality. When old they usually become filled with larvæ of certain fungus gnats and under the influence of these maggots melt down to a wet, brown mass.

SUSCEPTIBLE PLANTS.

Nearly all trees and shrubs may be attacked. The Armillaria, however, is a rather slow-acting fungus so that annual or short-lived crops usually are not

seriously injured; also plants with fine, slender roots are not much affected owing to the habit of the fungus of developing in roots of some thickness. It has been reported as attacking rhubarb and sometimes the rhizomorphs penetrate potatoes, causing rot, but ordinarily in California such plants are not injured. A few trees have seemed to be highly resistant and some practically immune. French pear is apparently immune while the trees are growing healthily. Black walnut and figs are considered highly resistant. Apples are certainly more resistant than stone fruits and Myrobolan plum is apparently somewhat more resistant than peach or almond.

CONTROL.

Affected plants may be saved if the soil is removed from the roots and the diseased parts removed, treating the wounds as in other cases of tree surgery with some disinfectant such as creosote or Bordeaux paste or corrosive sublimate (1-1000) followed with asphalt. Usually the disease is not discovered until it is too late to save the tree. In California the fungus generally works so deeply that the lower roots are practically all destroyed before the top shows evidence of trouble. Where the rhizomorphs come from a neighboring stump it may be entirely practical to remove them from the crown of the tree and scrape off the slight infection which has taken place in the outer bark. Evidently the fungus does not in any way poison the part of the tree which is not invaded and it becomes merely a question of saving sufficient roots to support the tree.

Preventing the spread of the fungus may be accomplished by several means. It has sometimes been recommended to pull out or dig out two rows of trees surrounding the margin of the spot, and this has been reported to be successful in a number of cases; however, the sacrifice is often great. The infected soil may be separated from the uninfected about it by means of a ditch. Where shallow-rooted trees like citrus are involved this is probably entirely practicable, especially in the shallower soils. It is doubtful whether it will be feasible to make a ditch more than about four feet in depth, so that for very deeply-rooted trees in deep soils the ditch may not be completely effective, but it is well worth trying.

The greatest pains should be taken to examine all roots removed in the digging and if any are found affected with Armillaria, the location of the ditch must be changed so that these may be included. All the diseased roots within the area must be surrounded by the ditch. The cost in high-priced orchards is not believed to be prohibitive. However, once opening the ditch will not be sufficient since it rarely will be found satisfactory to leave the ditch open during the summer and the digging would need to be repeated, probably about every two years. This comes about because new roots will cross the ditch and mingle with the diseased material on the other side and no advantage will result. Various experiments have been made in placing barriers of building paper or roofing paper, boards or concrete in the ditch before refilling. These experiments are still under observation. The lighter types of building paper have been found to be worthless for this purpose since plant roots pass through them readily. No recommendation as yet can be positively made concerning the use of barriers.

One matter which should be borne clearly in mind with regard to the ditch is that after being filled, it will not be possible to reopen the same ditch again unless an accurate record has been made of its position. By measuring the distance along selected lines from adjacent trees to the center of the ditch and making a careful map for record, the ditch can be reopened. Accordingly the map becomes an essential part of the ditch operations and, without it, the ditch is worthless. The Division of Plant Pathology, University of California, will be glad to assist persons who desire to map out Armillaria spots.

It is highly desirable that diseased areas should be cultivated separately from the rest of the orchard, since the fungus is probably spread through pieces of diseased roots which are carried along by the cultivating instruments and dropped near healthy trees. In small areas this may be very inconvenient and it will probably be possible to take precautions which will be adequate by making sure that no root pieces are clinging to the implement on passing the edge of the spot.

The use of carbon bisulfide has been recommended for killing the fungus in the soil and it is well known that under proper conditions it is capable of destroying the fungus; however, we have not yet succeeded in establishing the precise method of procedure. In wet ground, especially in heavy soils, the carbon bisulfide does not penetrate and is worthless. If the soil is too dry the carbon bisulfide escapes before the diseased roots are all penetrated and the fungus entirely killed. For use

in parks or park spaces where the cost is not a serious consideration, carbon bisulfide is probably a very promising material for destroying the fungus, but it should be used probably in dry soil, the surface of which could be covered in some way or soaked with water.

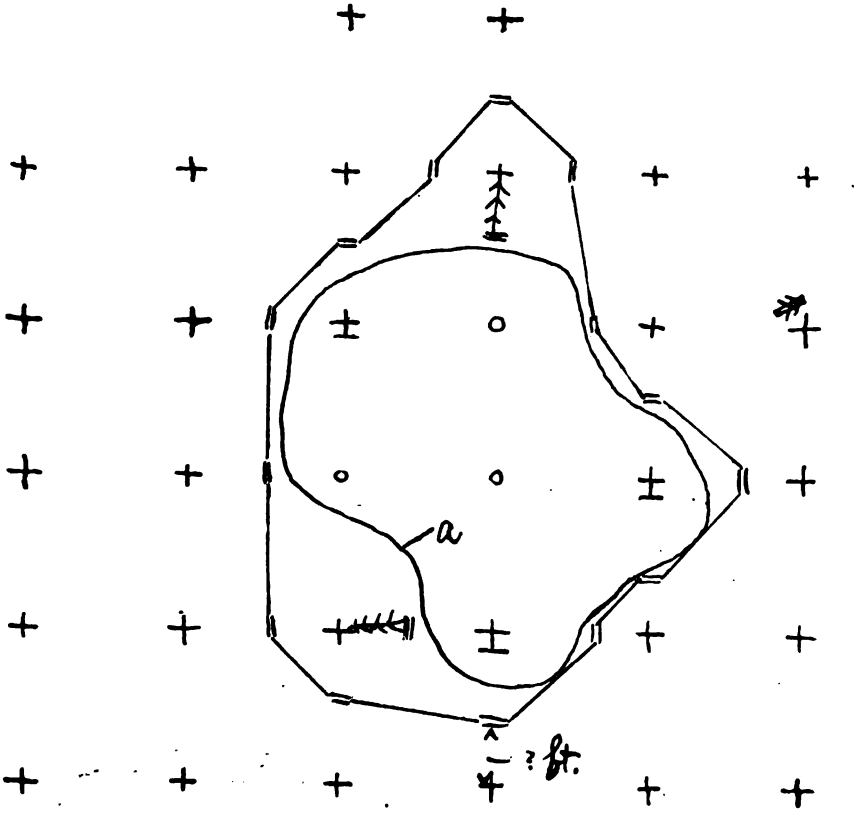

FIG. 39.—Suggests manner of making a map and ditch about an affected spot. The short parallel lines suggest points to make the first parts of the ditch. If diseased roots pass beyond the apparent limit of the spot, these must be followed out and if the fungus is established in the root system of the apparently healthy tree, the ditch should be located on the outside of that tree. The exact distance from the adjacent tree to the middle of these ditches should be marked on the map as well as in notes for use in subsequent years. At the right outside the spot is shown a piece of diseased root lying on the ground, evidently dropped in removing the trees which died in the vacant spaces. If plowed in before drying this would almost surely infect the tree near by. This shows the need of care in removing the diseased roots and the desirability of tilling the diseased spot separately from the rest of the orchard.

UTILIZING INFESTED AREAS.

Resistant trees such as French pears and probably figs or black walnuts may be freely planted where desired. An ideal arrangement would be to sow down the Armillaria spot to alfalfa, where that is desirable, or the spot might be cultivated as a vegetable garden. In some places the Armillaria spots have been cleared off, taking some trees around the edges, and utilized for drying grounds. Spots infected with Armillaria should not be used for growing nursery stock owing to the chance of establishing the disease in land not now affected.

Some plantings which have been made in affected areas where large holes have been dug seem to indicate that even susceptible plants may escape if the holes are made large enough and affected roots properly removed. Wherever large holes are dug and replanting is done the soil should be spread out evenly and all roots gathered up and burned. If this can be done in the summer so that the soil becomes thoroughly dry, the fragments of infected roots which might be overlooked will have the fungus safely disposed of by thorough drying. Special circumstances will arise in connection with controlling this trouble, owing to the wide variety of plants attacked, and the Division of Plant Pathology will be glad to give further advice or suggestions.

PEACH ORCHARD IN SOLANO COUNTY, CAL.

The peach is a valuable adjunct to our dried fruit industry.

THE COMMERCIAL LIQUEFACTION OF HYDROCYANIC ACID.

By GEO. P. GRAY, Berkeley, Cal.

INTRODUCTORY.

After several years of patient experimentation a California company has erected a plant at Azusa, California, for the commercial liquefaction of hydrocyanic acid to be used in citrus fumigation. Great credit is due the Dingle Bros., the principal members of the company, for accomplishing so daring a piece of chemical engineering in the face of discouragement and opposition on all sides. There is none to dispute the fact that they are the pioneers in an undertaking of this sort. There were no similar plants in existence to guide them in their construction work and there were many new problems to be solved in the handling and marketing of a fluid about which so little is known.

The ready acceptance by commercial fumigators of this new convenience seems to point toward the general adoption in the near future of liquid hydrocyanic acid in fumigation practice. Mr. William Dingle, the inventive genius of the organization, has already to his credit the development of the portable generator which he showed to be a commercial possibility in citrus fumigation. The end of the present fumigation season will determine whether or not he will have to his credit a second important step in the art of fumigation, and all within the short space of seven years.

The Fruit Growers' Supply Company financed a preliminary investigation of liquid hydrocyanic acid and is continuing the investigation in co-operation with the Insecticide and Fungicide Laboratory of the University of California. The writer was engaged in this work during August and part of September and is now co-operating with Professor E. R. Hulbirt, head of the science department of the Citrus Union High School at Azusa. These investigations have been confined exclusively to a study of the chemical and physical properties of the liquid. Field investigations have been under way for a period of several months by Professor H. J. Quayle of the Citrus Experiment Station at Riverside, and by Messrs. R. S. Woglum and H. D. Young of the Bureau of Entomology, U. S. Department of Agriculture. It is hoped through these investigations that by the close of the present season the status of liquid hydrocyanic acid in citrus fumigation will be definitely established.

The investigations of the writer have shown that the plant of the fumigating company is capable of producing a reasonably uniform and high-grade product, testing 95 to 98 per cent absolute hydrocyanic acid. The question of suitable containers for the liquid has not been fully answered, but experiments are now under way which will be available for the next season. It was also found that the purity of the liquid could be approximated by determining its specific gravity, provided the temperature of the liquid does not vary much from 60° F. This determination can easily be made by means of a hydrometer. The temperature, however, appears to effect the hydrometer reading quite materially. Investigations are under way which it is hoped will enable one to apply temperature correction to the hydrometer reading when made at temperatures other than at 60° F. Data is being obtained which will enable one to construct a hydrometer reading percentages of hydrocyanic acid directly after proper temperature corrections have been made.

The present system of measuring as the basis of settlement is considered to be illogical. The accurate measuring of so volatile and poisonous a liquid is not only difficult but dangerous to the operator. On the other hand it is a very simple matter to weigh, within reasonable accuracy, the liquid as it is delivered to the consumer. It is therefore strongly urged that the weight basis be adopted in transactions.

The knowledge of the chemistry and physics of liquid hydrocyanic acid is lacking in many particulars, especially the knowledge which is needed in its production, storage and use. The investigations indicated above as well as those of the commercial interests involved will answer many of the vital questions. In the meantime it seems desirable to get together from all sources whatever information is now available concerning its use. It is not intended to imply that the following

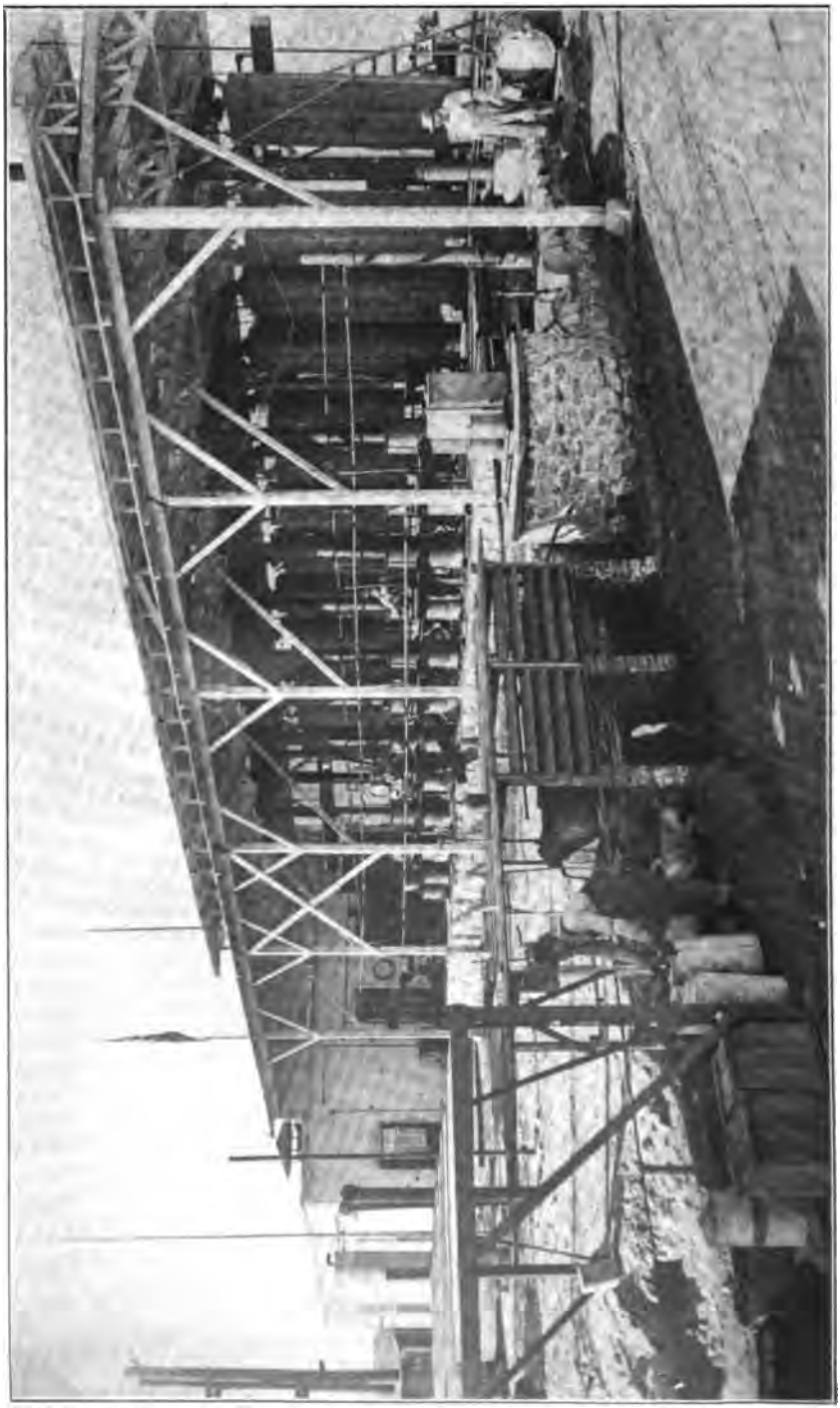

FIG. 40.—A model California plant for the production of liquid hydrocyanic acid.

recommended precautions are based entirely upon the observations of the writer. They have been compiled from all the sources of information available.

DECOMPOSITION AND EXPLOSION.

Under certain conditions liquid hydrocyanic acid will decompose with explosive violence when kept in closed containers. All the causes of this decomposition are not well understood. It is a well established fact, however, that small quantities of alkali (such as ammonia, soda and potash) favor decomposition. It has also been shown that the residue deposited in wholly or partially decomposed liquid is very active in starting decomposition when mixed with fresh liquid, somewhat in the same manner as traces of sour milk will hasten the souring of fresh milk.

Delivery drums, therefore, should be thoroughly washed and drained before refilling.

The pure liquid is colorless. The more nearly pure a liquid is, the less apt it is to spoil, or to corrode metals. The appearance of a yellow, brown or black color is good evidence that decomposition has started. Ammonia is frequently one of the products of decomposition and can be detected in decomposing cyanides by its ordor.

When a liquid begins to show color of any sort it should be used at once, if possible, and extra precautions observed in its handling.

The use of soap in safety valves and on the threads of plugs is thought to be a doubtful practice. If any considerable amount of this accidentally falls into the liquid, the alkali of the soap is apt to cause trouble.

The liquid and its vapors are both inflammable. Open flames should be kept away from containers, especially when emptying.

EFFECT OF HEAT.

The pure liquid boils at a temperature of about 80° F. If the liquid in a closed container is warmed to or above the boiling point, a pressure of several pounds per square inch will be developed. On opening such a container, gas will be violently expelled and if warm enough, the liquid itself may boil out of the opening. This would be not only a waste of liquid, but a source of danger to the operator.

It is therefore a dangerous practice to allow the liquid to become warmed to a temperature much above 70° F. or to entirely fill the delivery drums or other container with the liquid.

Heat is also thought to favor decomposition. The present practice of keeping the drums covered with wet sacks is very commendable, and should be followed with even greater care than at present. Under no circumstances should the drums be exposed to the direct rays of the sun for any length of time.

If the liquid is stored in a closed room, one should be very careful in entering and should not attempt to remove a leaky container without first airing out the room thoroughly. An electric fan would be very useful for this purpose if available.

ANTIDOTE.

The liquid is considerably more dangerous to handle than the sodium cyanide and sulfuric acid formerly in use. Any one handling the material should provide himself with an antidote. The irritating effects of the gas are much relieved by inhaling ammonia fumes. A few pieces of ammonium carbonate in a tightly-stoppered bottle can be easily carried in the pocket. This will give off ammonia fumes when opened and is more convenient than liquid ammonia. An antidote for external use and directions for first aid treatment can be secured at slight expense from the dealers in cyanide.

Suitable gas masks are not at present obtainable, but it is hoped that they will be in the near future. It appears that an effective gas mask should be in the equipment of every crew of fumigators, and that one should be on hand for use in emergency at any place where a considerable quantity of the liquid is stored or handled.

BRIDGE-GRAFTING ON CITRUS.

By E. H. PADDOCK, Orange, Cal.

When the present price of good citrus land is considered, and the remunerative possibilities of the same as determined by the past five years' average price of fruit, it is easy to see that each individual tree has an individual value, and if the productive possibility of any individual tree is reduced, of course the hoped-for profit is reduced, possibly for not one season only but perhaps for several years to come, depending largely on the agency which has caused the reduction in yield.

One of the most common factors to be considered as an agency causing individual tree losses is none other than the ordinary gummosis which makes its appearance known to the grower quite often only after the trunk of the tree has been entirely girdled, which means that in that case the tree has only a limited chance ever to survive the injury. The result usually is that the tree thus injured must be replaced with a new one and then a period of from four to six years' care be given before the old one is properly replaced. In that case the individual value of a productive tree becomes more apparent than it would if the value had been asked of one who had never had the experience of losing a good producer and then waiting to replace it with a new one.

FIG. 41.—All growth from the hand up has been made since the bridge was put in. Note the fruit.

Another agency of individual tree destruction which is met with in the citrus districts occasionally is none other than the common pocket gopher, which is, as I have told many, the most expensive animal which may be kept in a citrus grove. In the case of the gopher, however, there is quite often a chance of recovery as the cambium is not always entirely destroyed, and if the tree can be coated with parrafin wax immediately after the injury is done, healing or growth of new bark will soon follow, provided there were bits of cambium left from the attack; this is, however, only an occasional possibility. In the case of the girdling by gummosis there is no cambium left upon which new bark may grow, so the result there is usually positive in favor of the gummosis.

In either case upon discovery of the injury the natural desire of the owner is to at least make an attempt some way or other to save the tree. Just what methods others have used in their efforts to bring about the desired results may not be known to the writer and as this paper is on one method only, that of bridge grafting on citrus, a brief review of the methods used and the results of same will be given here.

In the early part of 1916, in particular in groves which had been inundated by the high water of the preceding winter, there were to be seen many cases of gummosis on both lemon and orange trees, and in some groves the loss from same appeared to be very heavy, so it was in going over these groves that the writer decided to do experimental work in bridge grafting to see if such actually could be considered as practical in saving trees which would otherwise have had to be grubbed out.

Bridge grafting in general, of course, is not a new idea, as it has been practiced a long time on deciduous trees, but to the writer no information as to the method being a success on citrus trees was available, so it was with a sense of anticipation that the experiments were undertaken.

Of all the cases in particular of which this article deals, the trees had been attacked by gummosis and the disease had progressed until the trunk of the tree had been entirely girdled for a distance of from eight to twelve inches. The foliage on these trees had also become yellow and they appeared to be rapidly dying. The owner of the trees had also given them up for dead and had planned to dig them out when solicitation was made to allow the experimental work. The injured portion of the tree in these cases was close to the ground as the bud union was from one to four inches above ground. As they were budded on to sour stock roots the injury very rarely extended below the bud union more than an inch at the extreme. For this fact the bridges selected were from sour stock seedling trees of length desired and about three-eighths of an inch in diameter. They were then carefully wrapped in waxed cloth such as budders commonly use, the idea being to prevent loss of moisture by evaporation over so great a space. Then the ends of the twigs thus wrapped were cut in a manner to allow inserting in the ends of the healthy bark on either end of the portion which had lost all the bark and cambium also. These ends when inserted, as would be expected, were bound firmly in place with budding cloth. Then the entire section of the tree operated on was carefully wrapped with canvas or burlap of sufficient thickness to prevent sudden or extreme changes of temperature and also to keep the enclosed portion from losing the required moisture which would otherwise be lost.

FIG. 42.—Showing clearly the girdled portion of one which has been bridged with grafts twelve inches in length.

FIG. 43.—Directly above the entrance of the bridge into the tree there is a ridged growth.

In every case thus experimented upon the result was entirely satisfactory. The unions were absolutely perfect as the photos show. Immediately following the uniting of the grafts the trees began to lose their yellow color and to take on a greenish tint until in a short time they could not be identified by their top appearance from others in perfectly normal condition.

These trees were all operated on in June, 1916; every graft has become a living bridge which is now satisfactorily answering for the proper development of the tree. In one case root grafts were tried and although they firmly united they failed to make the same satisfactory growth which the seedling bridges made.

In conclusion it is safe to say from the success gotten from the experiment that bridge grafting may be done on citrus trees as a practical and efficient method of saving trees which otherwise would have to be removed because of the injury from gummosis or gopher, and at a cost which would be small compared to the loss sustained by the removal of a productive tree.

FACTORS CONCERNING THE DROP OF IMMATURE CITRUS FRUIT IN CENTRAL CALIFORNIA.

(With suggestions.)

By F. R. BRANN, Lindsay, Cal.

From personal observations covering a period of approximately twelve years, I have found that the following factors are more or less important, as directly or indirectly causing the abnormal drop of immature citrus fruits in the San Joaquin Valley.

There are two distinct "drops" occurring during the early development of citrus fruits, known respectively as the "natural slough," which occurs when the fruit is first formed in April, and is, by far, of greatest economic importance, and the "June drop," which occurs in June when the young fruits are about the size of hazelnuts, and often larger.

Aside from the difference in size of the fruit and the dates of the two drops, there is another marked difference, viz: the stem is dropped with the fruit during the "natural slough" and retained by the tree during the "June drop."

There are five important factors which have a decidedly detrimental effect upon the "natural slough," whereas only one affects the "June drop.'

The five factors affecting the "natural slough" are, in their order of importance, as follows:

1. Atmospheric absorption of moisture from the tree during heat of day. *This condition is emphasized in the San Joaquin Valley districts.*

2. Plowing and deep cultivation during spring. *This is a common practice with a large number of citrus growers.*

3. Improper moisture content of soil; extreme dry or wet soil condition due to improper irrigation methods. *A condition quite common.*

4. Improper drainage and subsoil conditions. *Causes which are quite common and are due either to improper location or negligence on the part of the owner in correcting this trouble.*

5. Insect pests. There are four insect pests which affect the young fruit during the time of the "natural slough," either directly or indirectly, and cause a certain per cent of the fruit to weaken. They are the gray scale (*Coccus citricola*. Campbell), citrus thrips (*Scirtothrips citri* Moulton), the black citrus plant louse (*Toxoptera aurantiæ* Koch), and the green peach aphis (*Rhopalosiphum persicæ* Sulzer).

Under normal conditions the effect of these insects on the "natural slough drop" is comparatively light. In cases of severe infestation of gray scale the trees often give evidence of a weakened condition, and the drop is more pronounced.

The work of thrips and aphids then becomes rather serious, owing to the weakening of the attacked fruit through loss of moisture from the tender rind, which has been scraped or pierced by these insects.

The "June drop" would cause no anxiety to the citrus grower whatever, providing the "natural slough" was reduced 20 to 50 per cent.

The "June drop" is due to one direct cause—citrus fungus (*Alternaria citri*). This condition is more pronounced during certain seasons and in certain localities, but apparently affects trees of all ages alike, with very little varietal resistance. "Ruby Bloods" and "Tangerines" probably are the least affected by *Alternaria citri*.

The writer offers the following suggestions regarding corrective measures, which, if adopted and properly carried out, he believes will aid greatly in reducing the "natural slough" to a minimum.

It is a hard matter artificially to overcome atmospheric absorption of moisture from the trees. Too much irrigation water in the grove is dangerous to the root system as well as impractical. Overhead spraying is too costly, and doubtful as regards results. However, the writer is of the opinion that a strip of alfalfa 200 feet wide on the west and north sides of a 40-acre grove, if kept damp during April, May and June will aid greatly in supplying coolness and a humid condition for a considerable distance through the grove. It would serve a double purpose, for the cuttings, if applied to the grove, would add greatly in furnishing plant food and humus.

Deep plowing and cultivating should not be done between March 1 and June 15, for it is during this period that the trees are under the greatest strain—that of establishing new fibrous-feeding roots, developing fruit wood, blooming and setting fruit—and they should receive the fullest possible degree of efficiency from each and every feeder. When the soil is disturbed at this time to a depth of from four to eight inches, many thousands of the upturned ends of the little feeding roots are sheared or torn off, and this, in the aggregate, greatly decreases the functioning ability of the root system, weakening the trees to a degree and placing them in a condition more susceptible to atmospheric absorption.

The citrus tree, having the power of transpiration, draws moisture from the weaker portions to the stronger portions during the hot days, thus the tender developing fruit must suffer abscission of the stem tissues and fall to the ground.

In brief, for best results, the program of procedure should be about as follows:

Incorporation of plant food (fertilizer inert and available forms) with soil, by plowing and deep cultivation, should be done some time during October, November, December, January or February, leaving the surface ridged up high, two ridges to the middle both ways, and leave until June 15. This will allow proper surface drainage, aeration, irrigation and root feeding, and should not interfere with picking, hauling, pruning, spraying or fumigating.

The matter of cover crops is another issue which has considerable bearing on the "drop" in an indirect way, but is a proposition too lengthy to be dealt with in this short article. However, the writer is of the opinion that on account of several disadvantages in connection with the growing of cover crops, it does not compare favorably with other available methods.

Regarding moisture content of soil, it is very unwise to allow the grove to become too wet or too dry during April, May or June. A uniform moisture content of the soil is very essential to keeping the trees in a normal condition of vitality. It was due, mainly, to the two successive, extremely dry winters of 1916–17 and 1917–18, that the vitality of the citrus trees in general throughout the central California citrus district was so low. This low degree of vitality was more or less pronounced on certain groves, due to local conditions of disadvantage in connection with the already generally weakened condition. More attention should be given by the citrus grower to drainage and subsoil conditions, and when needed, shooting, subsoiling and the proper use of lime will give good economic results.

Excellent work has been done in the Lindsay district this season by a giant subsoiler pulled by a large "Holt, 75, caterpillar," running to a depth of four feet both ways, and thus greatly aiding in correcting drainage conditions as well as increasing rooting area, and providing deep aeration. Deep subsoiling every year, or every second year, will also cause uniformity of size of trees (considering other factors normal) by keeping the root systems of each tree in its own territory.

In the matter of insect pest control on citrus in Tulare County, fumigation with hydrocyanic-acid gas has, repeatedly, proved to be decidedly the most efficient means of controlling the citricola or gray scale. Various spray formulas have been tried under all conditions for many years with varying results, the average per cent of efficiency ranging from 78 to 90 as against that for fumigation of 95 to 99.

In cases where arsenical or oil sprays were used, serious damage was the result. (Ref. Cal. Citrograph, Vol. 2, No. 12, p. 12.)

In the control of citrus thrips, lime-sulphur straight in solution, or lime-sulphur and black leaf "40" make a very effective treatment, if applied three times, first application as peta's fall, the other two about ten days apart thereafter. However, it is a matter of doubt in the writer's mind if this treatment ever acts as an investment to the grower who uses it.

Wet winters do more to retard the propagation of citrus thrips than any other factor.

Aphids will be better controlled (if arsenical sprays are kept off the trees) by the common red ladybird beetle (*Hippodamia convergens*). Cover crops produce enormous numbers of early-developed aphids.

Katydids are not a serious pest and are being controlled by the birds and a small egg parasite known as *Eupelmus mirabilis*.

In order to reduce the development of citrus fungus (*Alternaria citri*) to a mimimum, it is a good plan to allow no decayed oranges to remain in the grove; adopt clean culture during winter, and keep trees pruned properly.

MEADOW MICE IN SANTA CLARA COUNTY.

By S. V. CHRISTIERSON, Sacramento, Cal.

Meadow mice cause serious losses to farmers, orchardists and nurserymen in different parts of the United States. In a single county in Virginia apple growers report that during the winter of 1916–1917, trees valued at $100,000 were destroyed by pine mice. With the exception of the mouse plague in Nevada, 1907–1908, which destroyed more than 18,000 acres of alfalfa, we have no record of serious outbreaks of field mice in the western states.

Much of this loss is due directly to the wanton destruction of the natural enemies of the little pests. Hawks, owls, snakes and weasels annually are destroyed in large numbers, although no better natural control of the smaller rodents could possibly be established. It is an entirely erroneous idea that all hawks or owls are destructive, there being only two or three species in California whose harmful proclivities overbalance the benefits, which the agriculturist derives through the destruction of meadow mice, gophers, rats and ground squirrels. In 1,274 barn-owl pellets collected in the tower of the Smithsonian Building in Washington, D. C., were found 1,991 skulls of short-tailed field mice, 656 of the house mouse, 210 of the common rat, and 147 of other smaller rodents. In 360 pellets of the long-eared owl, 374 skulls of small mammals were found of which 349 were meadow mice.

Meadow mice are very prolific, breeding several times each season, and producing litters of six to ten. Under favorable conditions they sometimes reproduce abnormally and become a menace to all crops. From Europe we have several records of plagues of species related to the meadow mouse, principally voles and lemmings, which became so abundant that all vegetation was destroyed, such plagues varying in extent from thousands of acres to whole provinces.

FIG. 44.—The California meadow mouse (*Microtus californicus californicus*): A destructive pest to young orchards, nursery stock and field crops.

Probably the most common of this species in California is the California meadow mouse (*Microtus californicus californicus*) and although known to be present from the Mexican to the Oregon line, throughout the length and breadth of the state, with the exception of the floor of the San Joaquin—Sacramento Valley, and a narrow coast strip near Cape Mendocino, very few reports as to serious damage ever have been received.

The first serious infestation reported from the Santa Clara Valley occurred last December when L. R. Cody, Horticultural Commissioner of Santa Clara County, asked the Rodent Control Division of the State Commission of Horticulture for assistance in suggesting ways and means of controlling a mouse plague on the L. B. Dutton ranch, 3½ miles north of San Jose on the Alviso Road. Accordingly an inspection was made by a representative of the Division on December 26, 1918, and the following conditions were noted:

By actual count the infestation averaged over 7500 burrows to the acre. This figure was estimated by counting the numbers of burrows to the acre, and by counting the number of burrows in the space between the trees (18 x 22) and multiplying by 110. Average infestation between 4 trees (396 sq. ft.) was found to be 70.

The infested tract contains approximately 75 acres of two-year-old pears with alfalfa planted solidly between the rows. Before trees were planted this land was a pasture, or as Mr. Dutton described it, "grassland." No doubt this grassland was inhabited by the meadow mice, and breaking up the sod by plowing did not destroy all nests and burrows. However, no serious depredations were noticed until last fall, when on inspecting the orchard to determine the necessary number of replants, Mr. Dutton found that a large number had been cut off by field mice. It was also noted that the alfalfa crowns were cut off here and there practically over the entire field. Poisoning with strychnin sulphate, using whole barley as bait, was tried, but due to the habit of these mice shelling the grain, the method was found to be only partly successful. Oatmeal was tried, but was too sticky and doughy readily to fall into the burrows; besides, it proved far too expensive for the results obtained. At the time the inspection was made Mr. Dutton was flooding the field, using each space between trees as a check; the soil having been plowed away from the trees serving as levees. One man did the irrigating and as the water percolated to the burrows driving out the mice, the irrigator killed them with the shovel. This is slow, tedious and painstaking work, but averages from 350 to 650 mice each day. As soon as the entire area is flooded by this process, the field will be harrowed, smoothed down with a brush drag, and the burrows being reopened, are poisoned with strychnin, using crushed barley as bait.

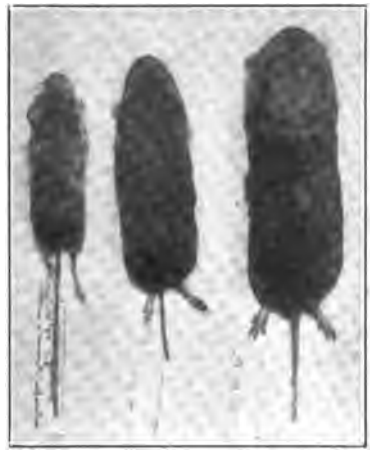

FIG. 45.—Three common rodent crop destroyers and orchard pests: At right: Pocket gopher. Center: Meadow mouse. At left: White-footed mouse.

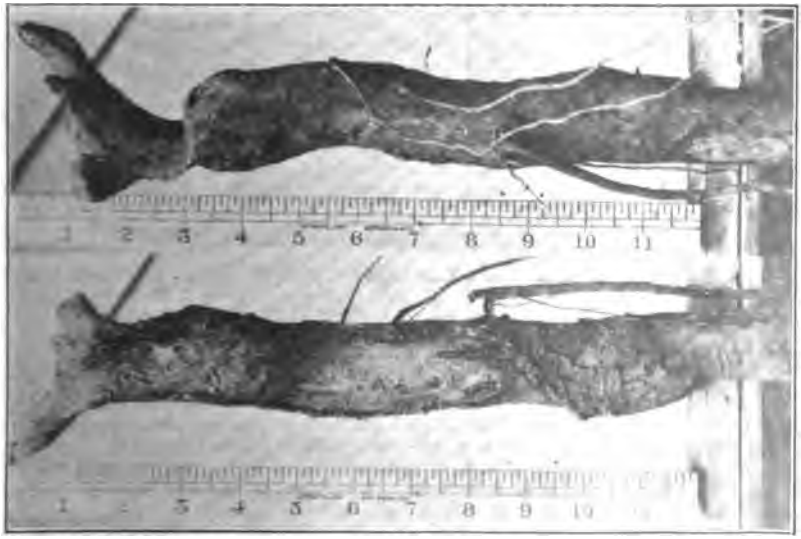

FIG. 46—Characteristic injury by meadow mice (*Microtus californicus californicus*), to roots of young pear trees.

Mr. Dutton values his two-year-old pear trees at $14 apiece, based on the annual production of his fifteen-year-old orchard. An average of 10 trees to the acre have been destroyed by the mice, occasioning a loss of $140 per acre, and it will cost at least $20 per acre to reset. Without considering the cost of replanting the alfalfa, flooding to destroy the mice at this time when irrigation is unnecessary, and the cost of plowing away from the trees to destroy possible mice nests and harbors in their immediate vicinity, Mr. Dutton estimates that his loss this year due to field mice, can not be covered by $10,000.

In California, meadow or field mice, heretofore, have not been regarded as a serious menace to crops and orchards. Henceforth, farmers being aware of the destructiveness of this pest, are urged immediately to communicate with their County Horticultural Commissioner, or to the State Commissioner of Horticulture, who will render them all possible assistance in combating this as well as other pests of orchard and farm.

FORMULAS FOR POISONING FIELD MICE.

The following recommendations for poisoning meadow and field mice are adopted from the U. S. Bureau of Biological Survey:

Meadow mice are readily destroyed by means of poisoned baits placed in their trails, or in the shallow tunnels which can be easily located by prodding with a bluntly pointed stick.

DRY GRAIN FORMULA.

Mix thoroughly 1 ounce of powdered strychnin (alkaloid), 1 ounce powdered bicarbonate of soda, and ½ ounce or less of saccharin. Put the mixture in a tin pepper box and sift it gradually over 50 pounds of crushed wheat or 40 pounds of crushed oats in a metal tub, mixing the grain constantly so that the poison will be evenly distributed.

POISONED CRUSHED WHEAT.

(*Sulphate Formula.*)

Dissolve 1 ounce of strychnin sulphate in 2 gallons of water by heating. Sprinkle the solution over 60 pounds of rolled or crushed wheat in a metal receptacle and mix well. If the preparation is to be kept for several days, 2 tablespoonfuls of borax may be added to prevent fermentation.

POISONED ALFALFA HAY.

Chop 50 pounds of good fresh alfalfa hay into about two inches in length with a feed cutter. Then place the hay in a large metal receptacle, and sprinkle with three gallons of fresh water. Thoroughly dissolve 1 ounce of strychnin sulphate in 2 gallons of water, by heating in a closed vessel, sprinkle over dampened hay and mix well.

POISONED GREEN ALFALFA.

Heat 1 ounce of strychnin sulphate in ½ gallon of water, and thoroughly dissolve; add to 1 gallon of cold water, and sprinkle this solution over 45 pounds of fresh green alfalfa cut into lengths of 2 to 3 inches. Mix until the free solution is taken up.

POISONED SWEET POTATOES.

Poisoned sweet potato baits are very effectual for both meadow mice and pine mice. The baits should be cut about half an inch square, or smaller, and washed and drained. From the pepper box gradually sift ½ ounce of powdered strychnin (*alkaloid*) and about 1/10 of this quantity of saccharin (previously ground together) over about 4 quarts of the dampened baits. Drop two or three of the poisoned baits into the shallow burrows used by the mice.

TWO INTERESTING WEEDS.

A New Weed and a Forage Plant Introduced Into Ventura County.

By E. O. ESSIG, Ventura, Cal.

HOARY CRESS.

During the summer of 1918, a new weed appeared in Ventura County which in habit resembled in some respects the morning-glory and other perennial running weeds. Specimens were forwarded to Professor H. M. Hall, of the University of California, who determined it as the hoary cress (*Lepidium draba* L.). This plant is a perennial with grayish foliage and may attain a growth one foot high. The leaves are large and ovate, with a few small teeth along the margins. The plant belongs to the peppergrasses in the mustard family. Jepson reports it as an escape in the San Francisco Bay region and as thoroughly naturalized and filling fields in Yreka, Siskiyou County. In the Weekly News Letter of the Commissioner of Horticulture, January 4, 1919, County Horticultural Commissioner Donald Penny reports it as a noxious weed in Santa Cruz County.

While the weed probably will never become as serious a pest as is the morning-glory or Canada thistle, it may prove of considerable trouble to farmers wherever it may occur, because of its resistance to sprays and other means of control.

SMILO GRASS.

A very beautiful ornamental grass which lately has been introduced in the environs of Ventura City, Ventura County, recently was sent to Professor P. B. Kennedy of the University of California for determination. It proved to be what is known commonly as "smilo grass," "San Diego grass," "mountain rice," and "many-flowered millet" (*Oryzopsis miliacea* B. & H.). This plant has been introduced in California from Europe and has been cultivated as an ornamental. It is a perennial with short rootstalks spreading very much like Johnson grass, but with less rapidity and is exterminated more easily than the latter.

In San Diego County this grass is being grown extensively as a dry-land forage crop, and in this respect is being highly recommended.

In Ventura County it has become an escape and occurs in waste places, in city lots, along barrancas, and in one case has invaded quite seriously a lemon orchard where it has become somewhat of a pest. It has been tried on our foothills without much success because of the trouble in securing an even stand due to the difficulty of germinating the seeds. Indications show that where a stand can be had it would be a valuable forage crop for many of the barren hills of the southern coast region of California.

NEW HOSTS OF OAK-ROOT FUNGUS IN HUMBOLDT COUNTY.

By E. O. ESSIG, Ventura, Cal.

From recent investigations, indications are that the oak-root fungus (*Armillaria mellea*) is to be found in practically all sections of the state and that there are very few trees and shrubs which are exempt from its attacks.

During the recent stay of Mr. S. H. Essig, former horticultural inspector in Ventura County, he reported two interesting host plants of this fungus in Shively, Humboldt County, Cal. Many fruit trees were dying in orchards in the vicinity, the orchards having been planted on land formerly occupied by redwood trees and other native shrubbery. His investigations showed that the fungus was reproducing

itself admirably on the old roots of the redwood trees, with which all stump land is copiously filled in that district. He also found that the roots of the wild hazel (*Corylus rostrata* var. *californica* A. D. C.) were favorite and often preferred hosts of the fungus. The wild hazel grew over much of the land which was occupied by the redwoods and the two hosts have afforded an abundant food supply for the oak-root fungus. As the roots of the redwoods are very slow to decay it is likely that fruit growers will be troubled with this fungus in all the logged-over lands of that county for some years to come.

It is obviously advisable that farmers select, for planting in districts as those described above, the fruit trees which are most likely to resist the oak-root fungus.

STANDARDIZATION OF THE BERMUDA ONION PACK IN THE COACHELLA VALLEY.

By HUGH KNIGHT, Riverside, Cal.

The production of Bermuda onions in the United States is of comparatively recent date—less than 20 years in fact. In 1900 the first crop of any commercial importance is recorded as being planted in southwest Texas and amounted to 63 acres. Since that time the industry has grown very rapidly. In 1910 Texas reported 3,514 acres, and in 1915, 9,343 acres.

Occasionally a grower got "rich" on onions, and there are a few who have made money from year to year, but a large percentage of growers usually came out on the wrong side of the ledger.

There are three main reasons for failure to receive remunerative returns for Bermuda onions. Probably the first and most important is, the lack of careful, scientific distribution of a perishable product. By scientific is meant distribution to the small town market as well as to the large centers.

The second reason, undoubtedly, is the idea that "anything will sell;" in other words, an effort to "put something over," to furnish a man a product he DID NOT BUY; the attempt to palm off any old onion for a No. 1 fancy pack. This is the particularly mischievous condition that standardization seeks to remedy—to establish mutual faith and understanding between buyer and seller.

Third, the great bugbear of overproduction, which really is not half as formidable as we have been led to believe. If underconsumption were done away with through scientific distribution, it is quite probable that "overproduction" would lose a great deal of its terror.

The farmers as a class are proverbially the hardest set of men on earth to get together and to get to stay together. Co-operation seems to be the last word in their vocabulary. All efforts to organize the onion growers and to establish standard grades had apparently failed when Uncle Sam took a hand in the game. The fiat had gone forth to economize, to eliminate waste as a war measure. The Bureau of Markets of the Department of Agriculture in the fall of 1917 established grades for Bermuda onions grown in the United States and known as U. S. Grade No. 1, U. S. Boiler Grade, U. S. Grade No. 2, U. S. Grade No. 3, and culls. These grades were to be used as a basis of inspection of Bermuda onions in all the important central markets of the United States by the Food Products Inspectors of the U. S. Department of Agriculture. In addition to this the Food Administration licensed the distributors. Then things began to happen. The Texas State Department of Agriculture quickly adopted the U. S. grades and the Legislature passed a standardization law providing for inspection of onions in the field or at shipping point.

This then was the condition that confronted the Coachella Valley Bermuda onion growers in the spring of 1918: A standardized and graded pack of onions put up by the Texas growers, inspected in the field by state inspectors, and inspected at destination by the Food Products Inspectors of the U. S. Department of Agriculture.

The only method to meet such competition was for the Coachella Valley growers to adopt similar measures. But how? The standardization law of the State of

California made no provision for the grading and inspection of onions. The legislature was not in session, and the marketing season was upon them. In this dilemma both the growers and distributors appealed to the State Horticultural Commissioner for relief.

A meeting was called at Thermal, on April 17, 1918, which was attended by Geo. P. Weldon, Chief Deputy of the State Horticultural Commission; County Horticultural Commissioner D. D. Sharp, of Riverside County; County Commissioner F. W. Waite, of Imperial County, and a number of interested growers and distributors, to determine, if possible, some practical method of solving this problem. At this meeting it was decided that if the growers would formulate a set of grading rules, the Horticultural Commission would furnish them an inspector to aid in enforcing the same, and would furthermore provide a certificate of inspection to accompany each carload of onions shipped out; but owing to the fact that this inspection work was not included in the duties of a horticultural inspector as provided by law, the growers would have to pay for his time and expenses whilst engaged in the onion inspection. This they agreed to do and the writer was chosen to undertake the work.

The bulk of the onions raised in the Coachella Valley are handled by two local associations—the Thermal Growers Association and the Thermal Cantaloupe Growers Union, the California Vegetable Union acting as distributor for the former, and Geo. A. Webster for the latter. Unfortunately, a good deal of antagonism exists between the rival organizations, and the manager of the Thermal Cantaloupe Growers Union decided that he did not need any inspection in the packing and grading of his onions, so that the inspection was confined to that part of the crop handled by the Thermal Growers Association. However, perhaps in the end it will prove a good object lesson, for there is nothing to bring home the benefits of a good thing like contrast.

The grades established by the Thermal Growers Association were four in number: No. 1, minimum 2 inches, maximum 3½ inches in diameter. No. 1 large, minimum 3 inches, maximum 4½ inches in diameter. Boilers, minimum 1 inch, maximum 2 inches, and No. 3, consisting of ill-shape, off-color and over-size.

The specifications for the grades were as follows: "All grades excepting No. 3 shall consist of sound onions of one variety that are free from doubles, splits, bottlenecks and seedstems, and which are practically free from damage caused by moisture, sunburn, cuts, disease, insects or mechanical means."

It will be noted from the above that the No. 3 grade is made to include everything and is practically a cull grade, as there are no restrictions as to what may or may not go into it.

As it is probable that a standardization clause for onions will be incorporated in the law, perhaps a few suggestions concerning the grades may not be out of place. The dimensions given for the three fancy grades appear to be very satisfactory, but some little change in the specification might be an improvement. There is a large proportion of onions that are perfectly sound, good marketable stock, but which, owing to being off-shape, over-size or off-color, can not be incorporated in a strictly fancy pack. Nevertheless, these onions are good food and should not be wasted.

A No. 2 grade should be established to cover onions that are sound, but of ill-shape, over-size or off-color. No. 3 grade should be abolished. Anything that is unfit for No. 2 grade should be classed as a cull. The specifications for the fancy grades—No. 1, No. 1 large, and boilers should read as follows: "Shall consist of onions which are sound, mature, bright, well-shaped, of one variety, free from doubles, splits, bottlenecks, seedstems and second-growth onions, and shall be practically free from dirt and other foreign matter and from damage caused by moisture, sunburn, cuts, disease, insects or mechanical means."

Cull onions would consist of bottlenecks, seedstems and second growth onions, or onions damaged by sunburn, moisture, cuts, disease, insects or mechanical means.

The results of the attempt at standardization in the Coachella Valley have been highly gratifying. There were no rejections of inspected onions. Furthermore, the inspection enabled the California Vegetable Union to command a premium of ten cents and better per crate, over the prices obtained by their competitors, which meant a saving of over $5,700 to the growers. The cost of inspection was less than one-half cent per crate.

Another valuable feature is the protection afforded the grower when his product is sold on a falling market, at which time the buyer is the loser and will only too often endeavor by every means to reject the car upon arrival at destination. In

such a case the federal inspector is called in; he sees the Certificate of Inspection, on the reverse side of which is printed the grading rules of the association, he inspects the onions by the grading rules and tells the buyer that he has received exactly what he bought. The buyer then has no option but to complete the purchase by paying for the car.

All the grading this year was done by hand in the field, a method which at best is unsatisfactory, owing to the human element entering into the equation. It is probable that another season will see the Coachella Valley Growers follow the lead given by the Texas onion producers who are using small mechanical graders of the "Boggs Potato" type modified to grade onions. It is only in this way that an absolutely uniform pack can be maintained.

In conclusion, opportunity is taken to express my appreciation of the co-operation afforded by the members of the Thermal Growers Association, and also for the unfailing courtesy and valuable assistance rendered at all times by the field agents of the California Vegetable Union, and particularly by Mr. J. W. Newman, manager of the Thermal Growers Association.

DRY SULFUR PREPARATIONS VS. LIME-SULFUR SOLUTION.

By GEO. P. GRAY, Berkeley, Cal.

There are two types of dry sulfur compounds on the market as substitutes for the well-known commercial or homemade lime-sulfur solution. The many conveniences in marketing and handling a dry substance are self-evident, but should not be taken advantage of at the sacrifice of efficiency. The additional cost of convenience is a point that must be decided by the user himself.

If intended for use as a winter spray against scale insects, a sulfur preparation is evaluated on the basis of the percentage of sulfur combined in the form of polysulfides and thiosulfate. The uncombined sulfur might also be included in the evaluation of these products when they are to be used against red spider, mildew or other pests for which sulfur is known to be effective.

The following will indicate the amount of the dry preparation to use as the equivalent of 1 gallon of commercial 33° Baumé lime-sulfur solution. In order to give the dry materials the benefit of the doubt, the uncombined sulfur is included in the calculations. The figures are based on analyses made by the laboratory:

Material	Average retail price	Total active sulfur (approx.), per cent	Cost of 100 lbs. active sulfur	Amount equivalent to one gallon lime-sulfur solution, pounds
Lime-sulfur solution (33° B.)	$11 26 per bbl.	26	$8 03	1 gal. weighs 10.78 lbs.
Soda-sulfur	8 00 per cwt.	57	14 03	4.9
Lime-sulfur, dry	10 40 per cwt.	55	18 90	5.0

SODA-SULFUR.

One of these types may be spoken of as alkali polysulfides. Older materials of this type are sold under the names "sulfide of soda," "sulfide of potash," "liver of sulfur," etc. The alkali polysulfides are compounds of either soda or potash and sulfur. These appear to be effective as a substitute for lime-sulfur solution. Aside from convenience in handling, they possess advantages over lime-sulfur solution as follows:

Soaps can be used with them as a spreader if desirable.

They are also compatible with soap-oil emulsions.

The most important disadvantage is the fact that they can not be used with lead arsenate as a combination spray. When used on foliage they are somewhat more caustic than the lime-sulfur solution.

Summarizing the above it appears that the alkali polysulfides are effective, convenient, and have some advantages over lime-sulfur solution and some disadvantages. Taking everything into consideration, these compounds do not possess enough advantages to warrant using them in preference to the older well established and standard lime-sulfur solution, except in some cases as a combination spray.

DRY LIME-SULFUR.

Samples of this material have been analyzed by the laboratory and found to contain the same constituents as lime-sulfur solution, that is, polysulfides and thiosulfate of lime. In addition, however, they contain about 20 per cent organic matter. The material does not go entirely into solution in cold water and there is some free sulfur.

So far as can be judged, the dry form of lime-sulfur when dissolved in water will produce a spray in all respects similar to the usual dilution of lime-sulfur solution, *provided equivalent quantities are used.* The chief point for consideration, then, in choosing between the dry form and the solution is the cost. Comparative costs are shown in the foregoing table.

If the manufacturer's directions for winter spraying are followed (10 to 12 pounds of dry lime-sulfur dissolved in 50 gallons of water) a spray will be obtained containing only about one-half as much active sulfur as in the customary 1 to 10 dilution of lime-sulfur solution. In defense of this half-strength recommendation the manufacturers claim that certain organic material which is incorporated into their dry compound prolongs the effectiveness of the applied spray so that much less than the usual amount of sulfur is required. A somewhat similar claim is made by the manufacturers of soda-sulfur compound. Field tests have not been made in California to determine whether or not these claims are valid.

This laboratory, therefore, will still continue to evaluate these and similar preparations of sulfur on the basis of the percentage of sulfur combined in the form of polysulfides and thiosulfate.

The fruit growers of California can not afford to set aside for the sake of convenience a well-established and thoroughly-tested spray practice and reduce their remedies to half strength unless this has been shown to be feasible by experiments of the most convincing sort. It would be better to use full strength at double the cost.

"TERMITE DAMAGE."
In the tropics, damage by termites, incorrectly called "white ants," often reaches huge proportions.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF DECEMBER, 1918.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	76
Passengers arriving from fruit-fly ports	3,685

Horticultural imports:	Parcels
Passed as free from pests	149,744
Fumigated	813
Refused admittance	197
Contraband destroyed	98
Total parcels horticultural imports for the month	150,852

Pests Intercepted.

From Australia:

Ptenidæ spp. in *Ceratonia siliqua* seed.

From Central America:

Pseudococcus spp., and *Aspidiotus cyanophylli* on bananas.

From China:

Lepidopterous larvæ in seed pods, herbs and beans.
Undetermined fungus on Manchurian apples.
Cylas formicarius in sweet potatoes.

From Florida:

Phomopsis citri, *Lepidosaphes beckii* and *Chrysomphalus aonidum* on citrus fruit.

From Hawaii:

Pseudococcus bromeliæ and *Diaspis bromeliæ* on pineapples.
Coccus longulus on betel leaves.

From Japan:

Larvæ of undetermined weevil in chestnuts.
Undetermined fungus and Coccids on tangerines.

From Mexico:

Diatræa saccharalis larvæ in sugarcane.
Undetermined coccid on croton plant.
Pseudococcus spp. on herbs.

From Nicaragua:

Calandra oryzæ in corn.

From South Africa:

Calandra oryzæ in corn and sunflower seed.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	18
Fish boats from Mexican waters inspected	14
Passengers arriving from fruit-fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	99,607½
Fumigated	7
Refused admittance	6½
Contraband destroyed	2½
Total parcels horticultural imports for the month	99,623

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli on bananas.

From Florida:

Aspidiotus spp. on vanilla plants.
Lepidosaphes beckii on hibiscus.
Howardia biclavis on hamelia.
Parlatoria spp. on alpinia.
Ischnaspis longirostris on cholcos.

From Missouri:

Sanninoidea exitiosa in peach trees.

From Oregon:

Fusarium on potatoes.
Aspidiotus perniciosus, *Lepidosaphes ulmi* and *Cydia pomonella* on apples.

From Texas:

Lepidosaphes beckii and *Parlatoria* spp. on oranges.

From Washington:

Leptothyrium pomi, *Lepidosaphes ulmi*, *Aspidiotus perniciosus* and *Cydia pomonella* on apples.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	20
Fish boats inspected	57
Passengers arriving from fruit-fly ports	46

Horticultural imports:

	Parcels
Passed as free from pests	10,754½
Fumigated	0
Refused admittance	2½
Contraband destroyed	9
Total parcels horticultural imports for the month	10,766

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli on bananas.

From Mexico:

Tetranychus mytilaspidis on lemons.
Chrysomphalus aurantii on oranges.

From Oregon:

Bacterium tumefaciens and *Eriosoma lanigerum* on fruit trees.
Hartiga cressoni in raspberry cuttings.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	5
Passengers arriving from fruit-fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	14
Total parcels horticultural imports for the month	14

RIVERSIDE COUNTY STATION.

Horticultural imports:

	Parcels
Passed as free from pests	6
Fumigated	0
Refused admittance	0
Contraband destroyed	1
Total parcels horticultural imports for the month	7

Pests Intercepted.

From Florida:

Lepidosaphes beckii on citrus fruit.

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VOLUME VIII No. 3

MONTHLY BULLETIN

OF THE

STATE COMMISSION OF HORTICULTURE

Cover Crop in Prune Orchard.

SACRAMENTO, CALIFORNIA MARCH, 1919

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THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

Acceptance for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917; authorized August 27, 1918.

Vol. VIII. March, 1919. No. 3

POST-WAR OPPORTUNITIES.

At this time the opportunity is presented for strengthening the framework of our varied horticultural pursuits in California. Many bills concerning the need of pure seed, standardization of fruits and vegetables and their containers, weed eradication and the introduction of beneficial insects have been recommended to the Legislature for approval.

There is no single food commodity in our markets, whether fresh or preserved, or whatever other food material, that under proper conditions of care eventually will not command at least a price which will compensate the producer. Not only will the demand not be lessened, but the world today has been taught that the true index of economy lies not in a cheap product, but in the guarantee of its wholesomeness as a food and the discriminating market of this day is being educated along the lines maintained and promoted by those who have the horticultural welfare of the state always in mind.

For obvious reasons, opposing combinations may endeavor to profit through the lack of regulations, but in the end such opposition must of necessity fall by virtue of its own unsound foundation.

The demands of foreign markets, whose conquest heretofore was undreamed, together with the needs of devastated countries and the ruling higher figures obtaining at present in this country, all point to further rapid development of affairs, horticultural and agricultural. With the way already prepared by practices recognized and patterned by others as having merit, it is safe to assume that with a reasonable degree of co-operation the future insistent movement of horticulture in California will always be "forward." G. H. H.

DECEPTION IN PACKING OF DRIED FRUITS.

During the past four years as never before, the evils of deception in packing fresh fruits have been plainly pointed out to the fruit growers and packers, and under the terms of the standardization laws it has been possible to bring about such an improvement that the industry as a whole now recognizes these evils, as well as the financial value of an honest pack.

While the large organizations are doing splendid work in improving and standardizing the character of the dried fruit pack, in a few cases speculative interests are disregarding the good of the industry as a whole and deception is practiced with a free hand, for at the present time there is no law which will prevent it. The need is fully as great as with fresh fruits, and it is only a question of time until the consumer will be protected so that when he buys a box of prunes, figs or other dried fruits the fruit beneath the facing layers will be of practically as good quality as that in the facing layer. At the present time deception of the worst kind is being practiced by some in the preparation of the dried fruit pack.

As an illustration a soldier in one of our army camps recently wrote to a well known county horticultural commissioner asking him to purchase several boxes of first-class figs. After considerable trouble the commissioner located what he thought to be a very fine grade of figs, at any rate the facing layers indicated that they were excellent, and the price was that of the very best. The figs were forthwith purchased and sent by express to the soldier who had visions of most excellent Smyrna figs which he and his friends could enjoy. Imagine his disappointment when he found that below the facing layers in the artistically prepared boxes the figs were scarcely fit for human food. In a letter to the commissioner he suggests that something should be done in California to prevent such dishonest practices.

The grower or packer who prepares such a deceptive pack, of course, knows that in principle the thing is wrong and if he can see further than the end of his nose he is also aware of the fact that such a practice results in disaster to the industry in the long run. But rather than consider the industry as a whole there are individuals and sometimes associations that are not so much interested in the fruit industry of tomorrow as they are in making a dollar for themselves today.

The proposed amendment to the Fresh Fruit Standardization Law provides, among other things, that a deceptive pack of dried fruits shall not be allowed, in the following words: "It shall be unlawful to prepare, sell or offer for sale, a deceptive pack of fresh fruits, fresh vegetables, or dried fruits or dried vegetables, or to mislabel any package of any such fruits or vegetables." A deceptive pack is defined as "any package of fruits or vegetables which has in the outer layer or the exposed surface fruit or vegetables which are so superior in quality or condition to those in the interior of the package, or the unexposed portion, as to materially misrepresent the entire contents."

Misrepresentation in packing dried fruits as well as fresh fruits must be stopped, if California fruits are to gain the reputation and command the uniform prices that they should. The consumer is not willing to put his money continually into something, a small part of which is good, and upon which part the valuation of the entire package, most of which is inferior, has been based. The state should be vitally interested not only in maintaining the present splendid reputation of California dried fruits in the markets of the world, but also in supporting the organizations in their efforts toward improvement in packing, and, above all, in preventing rank deceptions which are sometimes practiced.

G. P. W.

ERADICATE OR CONTROL?

There is no phase of economic entomology or, more broadly speaking, of pest control, which is more indicative of progress, or which better illustrates the spirit of the times in which we live, than the present trend toward a policy of prevention of infestation or infection of plants and plant products by pests and diseases. The advantages of keeping pests and diseases of plant life out of any definite geographical region—over fighting them for all time to come—surely are obvious to every one. In times now gone by the function of an economic entomologist was limited to the study of life histories of pests and the devising of control methods. Later the field was broadened to embrace the exclusion of pests by a system of plant quarantines and inspection, a step which was, even by some entomologists, ridiculed or looked upon as the dream of an impractical scientist. The creation of the Federal Horticultural Board by Congress, however, put the final stamp of approval on plant quarantine as an economic necessity, and now the state government which does not support a plant quarantine and inspection service is not giving its agricultural industry the best there is to be had in the way of protection.

The next step forward is the policy of attempted eradication or extermination of pests which have, in spite of quarantine and inspection, become introduced and established over a small area. To intimate that pests possibly may get through quarantine lines or elude inspectors, even in a state so well protected as is our own, is in no sense a criticism of such service, because in the past there have been avenues of entrance which could not be closed. It is in cases of this kind, where pests have broken through in spite of the defense system, that the question of eradication comes up.

It is useless, perhaps, but none the less interesting, to scan entomological history and find there the examples of lost opportunity in this connection. In 1894 the Federal Bureau of Entomology sent an expert entomolosist to Texas to investigate and report on a new cotton pest which had appeared along the Rio Grande. This expert urgently recommended, after thorough investigation, that "laws should be passed decreeing the Rio Grande border of Texas for a width of fifty miles to be a non-cotton-producing belt, compelling all persons to abandon the raising of cotton in that area, and providing for the destruction of all cotton plants (and other Malvaceae if such exist) within the same." The statesmen of Texas turned a deaf ear to these recommendations, with the direct result that the cotton boll weevil now reduces the value of the cotton crop of the southern states many millions of dollars annually. This experience has not been without its value, for when the pink bollworm, another serious cotton pest, appeared recently in Texas in much the same way, practically the same recommendations were put into effect with the result that the elimination of this perhaps even worse pest is now in sight. The lesson has been learned in Texas, but at enormous expense.

In 1889 the gipsy moth, well known at that time as a serious pest in Europe, was confined to an area of one and one-half miles long by one-half mile in width at Medford, Massachusetts. At that time Professor Fernald recommended its extermination and Riley and Howard of the Bureau of Entomology agreed that "it can be entirely killed out with the expenditure of a little time and money." These recommendations by the leading entomologists of the country were not acted upon, however, and for the past fifteen years the federal government and the New England states have been spending a million dollars annually simply in an effort to check its spread, with no end in sight.

To come closer home, in the year 1889 all the purple scale in this state existed on two carloads of orange trees shipped in from Florida. The absolute destruction of all the trees planted out from this shipment would have been a small price to pay for freedom from this scale, since become one of the worst pests of citrus trees and fruit in California.

Other cases of this kind may be found on looking into the records, but these instances of opportunities now probably forever lost to us should serve as a guide to future action. Today we are facing such opportunities in California. The citrus whitefly exists in two localities in the state, distributed over a very small area on city trees. It is the worst insect pest of citrus in Florida. The Mediterranean fig scale occurs in one locality within the state, distributed over a few acres of orchard. It has great possibilities as a pest on a fruit which is rapidly growing in commercial importance and which is now practically free from such pests. The Japanese mealybug occurs on a few acres of citrus in one locality in California. Its potentialities are unknown, but we have already enough mealybugs.

Will we profit by the past and make an earnest effort to eradicate the citrus whitefly, the Mediterranean fig scale and the Japanese mealybug, or will they, too, go down in entomological history with the cotton boll weevil, the gipsy moth and the purple scale, as glittering examples of "lost opportunity?"—H. S. S.

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THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

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SELECTING A TRACTOR FOR THE ORCHARD OR VINEYARD.

By J. B. DAVIDSON, Davis, Cal.

The largest number of inquiries on any one subject now coming to the Division of Agricultural Engineering of the College of Agriculture, pertain to tractors and refer to selection in particular. This, perhaps, indicates that the selection of a tractor is not only a problem with a large number of ranchers, but also a very perplexing one. Three or four years ago the majority of inquiries were concerning the relative economy of horse and tractor power, but now this question is not so prominent and the outstanding question is—what kind of a tractor to buy. It is evident that an attempt to answer this question has not always satisfied, although a conscientious effort is made to be of service. When the conditions are known under which the tractor must work, it is easier to offer definite suggestions.

THE DEALER AND THE MANUFACTURERS.

It is easy to conclude after coming in contact with an occasional example of bad faith on the part of the dealer or manufacturer toward the tractor purchaser, that the selection of the dealer is almost as important as the selection of the tractor itself. The sale of a tractor should carry with it a guarantee and assurance based upon the responsibility of the house making the sale, that the tractor sold is adapted to the work for which it is purchased, and that the seller intends to help make the tractor a good investment. The view held by a few dealers that their responsibility ceases as soon as the order is closed is not good modern merchandising. If the taking of a commission is to represent a "square deal," the seller is under an obligation to furnish the necessary repairs as long as the tractor may be used.

It is fully realized that most successful machines had a small beginning and good tractors manufactured in a small way should not be discriminated against, but fly-by-night concerns with undeveloped machines should be carefully avoided.

SERVICE.

Much is made today in present day tractor sales of the service rendered, and no doubt this is a very perplexing problem for the conscientious dealer as well as the purchaser. Service is usually referred to as the assistance given the tractor owner in the care, repair and adjustment of the tractor after it has been put to work. It is undesirable from the purchaser's standpoint to have too much of such service rendered promiscuously without charge because the operator will call upon the dealer for more service than is necessary, and inasmuch as the cost of the service must in this case be added to the purchase price it makes the first cost of the tractor too high. It would seem that only enough free service should be rendered to guarantee good faith and confidence upon the part of the seller and all other assistance not charged to a faulty construction should be paid for. It would seem that the best service arranges for providing quickly the tractor's future needs in the way of mechanical skill and repair parts rather than to furnish an unlimited amount of gratuitous service. In selecting a tractor, it would be well to determine accurately the dealer's service policy.

SIZE.

A tractor that is too large does not give good economy either in investment or fuel economy. For most operations, in orchard cultivation, a large unit is of little use because it is not needed for the implements to be used. Unless much too

small a tractor does not economize in the use of labor, one of the principal items in the cost of operation. Practice seems to indicate that a tractor ought to have capacity to draw the same load as six work animals, or in other words, a capacity of 25 to 30 inches of plows and a six-foot double-disk harrow or larger. Some orchard and vineyard men use a rather large tractor with equipment to cultivate the entire middle between rows at once over. Such a plan saves much labor. At least fifteen draw-bar horsepower will be needed where such practice is followed.

TYPE.

The type of tractor will be determined largely by the character of the soil and operating conditions. If irrigation is practiced or the soil especially light, with little supporting power, the track-laying tractor has the advantage; while under other conditions with little need of operating over soft soil, the wheel type of tractor has the advantage in simplicity and cost. The practice followed in pruning the trees will determine whether the tractor must be low or not.

CONTROL.

One of the most important factors in the selection of an orchard tractor is the matter of control. It is quite necessary to be able to drive the tractor accurately and easily. Any purchaser would do well to test out these characteristics thoroughly before purchasing, observing whether the tractor can be manipulated among the trees with safety and without undue exertion on the part of the driver. A tractor that can be driven at any desirable and reasonable speed has a still further advantage. It is only by driving a number of tractors in the orchard that the importance of control can be fully appreciated. It perhaps will be well to mention that convenience and safety should be mentioned in this connection. Recently a rancher complained that it often required an hour or so each day to start his tractor. It is possible that the owner was much at fault, but it is obvious that a good tractor must provide facilities for sure and easy starting.

SUCCESSFUL OPERATION.

There are three principal factors involved in the ultimate success of the tractor, *i. e.*, the tractor, the work and the operator. Of these, no doubt the latter plays the most important role. To have success with a tractor, the operator must understand and feel for the machine—he must have faith in it and like to work with it. A man not in sympathy with the tractor is not apt to succeed with it.

To care for a tractor, an operator must be able to inspect the tractor and detect trouble as it arises and before it becomes serious. Most of the troubles with tractors that are serious in character appear gradually. Furthermore, certain parts of a tractor are subject to wear and the capable, efficient operator as distinguished from the one that is not, is the one with the necessary skill to make the adjustments needed, to compensate for wear. The principle item in care of the tractor is lubrication. It is claimed by those making a study of the matter that nearly ninety per cent of the repair bills on tractors can be traced to faulty and inadequate lubrication. This may not have a direct bearing upon selection other than to point out that the lubrication system should be carefully studied in making a selection.

EQUIPMENT.

Finally, no tractor can do its best work unless used with suitable implements. These should be of such a size as to give the tractor a good load, not too heavy or too light—not too heavy because overloading is the father of much tractor trouble, and not too light because of the poor economy. Like the tractor, these tools must be easily managed. The modern power-lift plow has many advantages. The tractor implements with lever within easy reach are distinctly more convenient that those in use for horse power.

THE EVAPORATION OF VEGETABLES.

By W. V. CRUESS, Berkeley, Cal.

The drying of vegetables for home use has long been known to the American housewife. Many families in the South and in the Middle West have dried corn and saved the corn for winter use as long as corn has been cultivated by the white man, but the first industrial production of dried vegetables probably occurred during the Klondike rush. At that time, a number of large concerns started operations and several fruit dry-yards in California produced dried vegetables for use in Alaska. The industry lasted only a few years and then became practically extinct.

During the Great War in Europe, the Expeditionary Forces of England and the Colonies were in need of vegetables. These could not be supplied in sufficient quantity by the European growers of vegetables. Canada's army especially was badly in need of fresh vegetables or a product which would compare in quality with the fresh article. Under the stimulus of very favorable contracts from the Canadian War Department, the drying of vegetables was taken up on a very large scale by evaporators in New York and in southern Canada. The ordinary New York apple kiln dryer was employed at first, although it produced an inferior article. Speed was necessary and quality was a secondary consideration at this time. Later in the war, the industry greatly increased and rapid strides were made in the improvement of evaporators and processes. Special forms of evaporators were developed and special means of preparing the vegetables for drying were employed. On the Pacific Coast, the industry was early given attention by Wittenberg-King Company of Oregon, and by E. C. Horst Company of California. Mr. Horst was especially active in getting his products before the American War Department during the first months of the war. As the American Expeditionary Forces grew in numbers, it became necessary to supply them with evaporated vegetables. Contracts were made throughout the United States wherever evaporators were located or could be built in a short time. In California, Mr. Horst has done the major portion of the evaporation upon government contracts, although several other firms have delivered large quantities of dried vegetables. Up to the present time, practically all activity has been on war contracts. Very little has been done to supply the civilian needs.

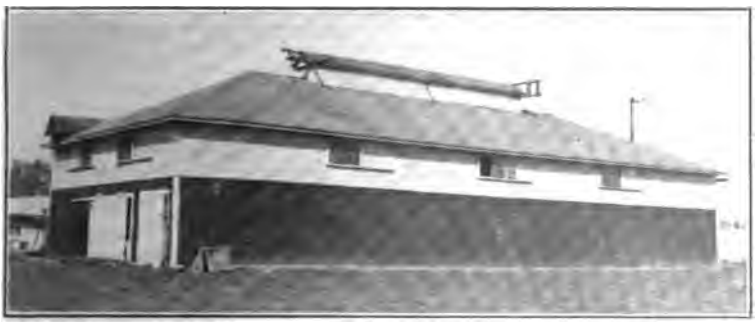


FIG. 48.—Hot-air blast evaporator near Woodland, Yolo County.

In addition to the large scale evaporation just mentioned, a great deal of evaporation has been carried out upon a community scale and also in the home kitchen. The amount dried in individual evaporators in this way has been small, but in the aggregate the quantity has been very great. The small scale evaporation was taken up to preserve the surplus of war gardens that could not be saved by canning because of the serious shortage of tin plate and glass jars. No one can say whether the evaporation of vegetables has come to stay or not, but we can say, however, that the interest in the process at present is very widespread and keen.

There is at the present time considerable confusion in regard to the proper name for dried vegetables. Many firms have adopted the term "dehydrated vegetables." Others have chosen the terms "desiccated," "evaporated," etc. All of those terms

mean "evaporated vegetables" and there is no particular fundamental difference in the processes used. The adoption of the term "dehydrated" may, however, in time serve to distignuish artificially evaporated products from the sun-dried products. This would be its main value.

1. Advantages of Evaporated Vegetables.

Evaporated vegetables are small in bulk as compared with the fresh article. Their weight is from one-tenth to one-twentieth that of the canned vegetables. Their use would make it possible to have fresh vegetables or a satisfactory substitute throughout the winter. The dried vegetables are cheap in price compared to the price paid for the canned article. This statement needs qualification at the present time, because the present prices asked for dried vegetables are in most cases exorbitant. Our experience in community drying has shown that the product should be sold for very much less than the prices now asked.

Experiments by eminent biological chemists have shown that green vegetables contain a growth-producing compound called, for lack of a better name, a vitamin. This substance has been found to be practically necessary to the activities of normal bodily vigor and for the growth of young animals and children. This vitamin is most abundant in such vegetables as spinach, cabbage, chard, and other green succulent plants. In the Eastern States, fresh vegetables are very dear and very scarce during the winter months. It would be possible by using these evaporated green vegetables to supply the bodily needs for growth-producing vitamin. It is thought that drying does not alter this compound. It may be interesting to note in passing that a similar vitamin is found in the husks of cereals, and that where polished rice is used, this vitamin is removed and prolonged diet on polished rice results in a disease known as beri-beri. Beri-beri can be prevented by the use of unpolished rice or by a liberal green vegetable diet. Thus it may be seen that dried vegetables may come in time to enjoy a very important place in the diet of families residing in a severe climate, such as that existing in the eastern United States.

2. Disadvantages of Evaporated Vegetables.

Evaporated vegetables have several disadvantages. They must be soaked in water for several hours before they are prepared for the table. This is considered by many housewives a very serious disadvantage; that is to say, one can not use them on the spur of the moment, but must plan the meals at least four or five hours ahead. Another defect is the slight loss in flavor which results during evaporation. The evaporated vegetables are not quite equal in flavor to the fresh article. This defect, however, is not very pronounced. Another objection that is sometimes made to dried vegetables is that they attract moths and weevils and also in some cases take up moisture and become moldy unless they are stored in insect-proof and moisture-proof packages. This objection of course would be overcome by the use of tin cans or paraffin boxes. None of these defects is serious enough to prevent the general use of the product.

3. Types of Evaporators for Industrial Production of Evaporated Vegetables.

There are several points to be considered in designing the construction and operation of evaporators. The evaporator should handle the product without altering the composition and quality of the material. It is desirable to retain as much of the original color as possible, to prevent serious changes of flavor, and to overcome the tendency of the vegetable to become tough and woody during the drying process, to retain the cooking qualities of the fresh article as much as possible, and to retain the full food value. It is proposed to point out in this article how these objects may be attained.

Many patent forms of evaporators are on the market and these vary in price from five dollars to as high as one hundred thousand dollars for each unit. Many of these are very excellent in design and give good results. Others have not proved so very satisfactory. There has been a tendency of late to exploit the manufacture of large installations by advertising the sale of stock and by the use of rather extravagant promises in the way of commercial development. Nevertheless, there has been a great deal of legitimate development in the manufacture of evaporating machinery and many reliable forms of evaporators are to be had for a fair price.

Discontinuous Hot Air Blast Evaporators.

This style of evaporator has been used extensively and has given satisfaction. It usually consists of a tunnel or long chamber fitted with racks for trays, or so arranged that the trays may be placed in the chamber on trucks. Through this chamber is forced a blast of hot air. A large fan is used to produce the air blast and the air is heated as it passes over steam coils. A very excellent form of this evaporator may be seen at the American Products Company's plant in San Francisco. In this particular plant, a tunnel about seven feet wide by seven feet tall and seventy feet long is used. The tunnel is inclined from the entrance end toward the exit end. The trays are placed on trucks and enter the dryer at the upper end. When the dryer is filled and in operation, a carload of dry trays is removed from time to time at the exit or lower end and is replaced by a loaded car of fresh vegetables at the upper end.

FIG. 49.—Stack evaporator showing trays in place.

A number of evaporators have been constructed in California by the conversion of the ordinary hop kiln into an air blast type of evaporator. Cabinets have been built on the kiln floor with tray racks and with connections to a ventilator and to a hot-air chamber. A hot-air chamber connects to a large fan and steam coils. Air is blown into this chamber and forced upward through the trays in the cabinets. This style of evaporator has been extensively used in the Sacramento Valley by E. C. Horst. In the writer's estimation, the tunnel type of dryer is more efficient and less costly to operate.

Continuous Air Blast Evaporator.

Where the labor cost is to be cut to a minimum and where a large output is desired, a continuous evaporator would probably be chosen. This evaporator consists of a number of belts made of hardware cloth. Several of these long belts are placed one above the other and they are enclosed in a long air-tight chamber. The prepared vegetables enter the evaporator on the upper belt and are carried the length of the chamber against the blast of hot air. They drop from this belt to a lower one and again traverse the chamber. Enough of these belts are used to cause the vegetables to remain in the drying chamber the required length of time. They are handled entirely in an automatic manner and require little attention and a very small amount of labor is necessary in their operation. A sample of this style of evaporator may be seen at Middle River, California, in the plant of the Valron Manufacturing Corporation, operated by Mr. C. C. Moore. This dryer is used for drying potatoes and potato starch.

Stack Evaporator.[1]

In the Watsonville district, the stack evaporator is used for drying apples. These have also been tested for the drying of vegetables and found to be satisfactory. This evaporator consists of a number of cabinets placed directly over a furnace pit. In the furnace pit is placed a large wood-burning or oil-burning furnace and a number of lengths of nine-inch to sixteen-inch radiating or flue pipes. Hot air rises from the pipes and passes through the trays containing the vegetables to a ventilator placed above the cabinets. The main objection to this evaporator is that the bottom trays dry more rapidly than the upper trays and there is a tendency for the fruit or vegetables to become scorched if the evaporator is not closely watched. This evaporator, however, could be used during that part of the year when they are normally idle.

[1] (See Farmers' Bul. 903, U. S. D. A.)

The apple kiln evaporator used in New York is almost identical with a hop kiln and is similar in general design to the stack evaporator. It was used very extensively in New York in the drying of vegetables and was found rather unsatisfactory because of the necessity of stirring the vegetables with a shovel or a fork during the drying process. This resulted in considerable breakage and in sticking of the vegetables together. The product was not very attractive in appearance, according to accounts of those who have seen this evaporator in operation.

Tunnel Evaporator.[1]

This style of evaporator is used extensively in Oregon and Washington for the evaporation of apples and prunes. It consists of a series of narrow chambers resting above a fire pit. The tunnels are usually about twenty feet long by five feet tall by three feet high. They slope gently from the upper to the lower end. The trays are entered at the upper end and the dried product is taken from the lower end. The hot air rises from the fire pit and enters the tunnel through a three or four-foot opening at the lower end and passes over the trays to the ventilator which is placed at the upper end of the tunnel. The capacity of each tunnel is small but it is possible to erect any number of these in units of three tunnels each. This style of dryer is considered superior to the stack evaporator because it uses the heat more efficiently and completely, and does not have such a tendency to scorch the product; that is to say, the temperature can be regulated more accurately. Where the dried vegetables are to be produced on a moderate scale, this style of evaporator is recommended in preference to the stack evaporator.

4. Types of Evaporators for Community Operation.

There is at present a marked tendency for the erection of so-called community canning or evaporating plants, for the handling of products raised in home gardens or in small commercial vegetable gardens. A number of different forms of dryers have been successfully used for this style of work.

FIG. 50.—Exhaust fan showing connection of fan to tunnel.

The Air Blast Dryer Using Low Temperature.

During the summer months the air at ordinary temperatures has very great drying capacity. This principle is taken advantage of in this style of dryer. The evaporator consists of a chamber about twenty feet long, three feet wide, and about four or five feet deep. Wire screen trays are placed in this tunnel or chamber and the ordinary outside air is blown over them. No attempt is made to heat the air. The temperature of the air will vary from ninety to one hundred or more degrees Fahrenheit, according to the weather conditions of the locality. For an evaporator of this size a fan delivering about five thousand cubic feet of air per minute is desirable. The fan known as a disc fan is very suitable for this purpose. It is inexpensive, simple in design, and easy to operate. Such a dryer was built at Kentfield by Congressman Kent during the 1918 season. It was used by the women of Mill Valley and Kentfield. The quality of the products dried in this evaporator was very high. In the writer's estimation, this style of evaporator will produce by far the best grade of dried vegetables because the temperature used is low and there is no danger of scorching or overcooking. The evaporation is surprisingly rapid; most vegetables can be dried in less than ten hours.

[1](See Farmers' Bul. 903, U. S. D. A., for plans.)

It is often possible to find a second-hand fan or a second-hand planing mill exhauster for use in such dryers. An exhauster draws the air through the evaporator and has certain advantages over a fan. Figure 3 shows such an installation.

It is very probable that the style of evaporator just discussed would be very popular throughout the San Joaquin and Sacramento valleys and would probably give the best results of any style of dryer for community plants. Farmers' Bulletin 918, of the United States Department of Agriculture, describes this dryer fully.

Other Evaporators.

The stack evaporator and the tunnel evaporator described above can be used to good advantage in community work but are not quite so simple to operate as the air blast evaporator. These driers already have been described.

5. Kitchen Size Evaporators.

In Farmers' Bulletin 841 of the United States Department of Agriculture will be found a full description of the various styles of evaporators for home use and further data will be found in Farmers' Bulletin 984. In most cases these evaporators consist of a small box about twenty-four inches long by eighteen inches wide and about sixteen inches tall. The bottom of the box is open and a door forms one end. It is fitted with runways for small trays and with metal legs to keep the evaporator from the direct heat of the fire. If an ordinary wood-burning or coal-burning kitchen range is used, the bottom of the dryer can be left open. If gas flame is used it will be necessary to place a piece of sheet metal over the flame or place a metal bottom in the evaporator. A very simple dryer can be constructed of wire screen by cutting several pieces about eighteen by sixteen inches in size and suspending these by wires over a kitchen range. These simple inexpensive evaporators can be made to save a large amount of material from the home garden during the summer.

Fig. 51.—Community drying tunnel showing stack of trays ready for the dryer.

6. Sun Drying of Vegetables.

The University has during the past two years carried on numerous experiments on the drying of vegetables on ordinary fruit trays in the sun. It has been found that the vegetables dried in this way lose a great deal in flavor and in appearance. They are not nearly equal to the artificially evaporated products. The additional objection is that they become infested with the larvæ of insects during the drying period and almost invariably spoil in storage unless they are sterilized in an oven before they are packed. The sun drying method is not recommended for general use.

7. Preparation of Vegetables for Evaporation.

Some vegetables must be parboiled or blanched before drying in order to prevent darkening or loss of flavor during the drying process. Potatoes are first peeled and then cut in slices, a little less than a quarter of an inch in thickness.

Figure 52 illustrates a common type of peeler used in preparing the potatoes for the slicer. This peeler consists of a metal cylinder lined with emery. There is a revolving disc in the bottom which throws the potatoes against the sides of the peeler, causing the skin to be grated off. A spray of water passing through the

peeler washes these gratings to the sewer or to a settling tank. It has been found that a peeler of this sort will waste about thirty per cent of the weight of the potatoes. They must be trimmed by hand after leaving the peeler. The total loss in weight is about 35 per cent.

FIG. 52.—A practical vegetable peeler.

Mr. Horst found that by peeling by hand he greatly reduced the loss and obtained a very much nicer appearing product. The loss in hand peeling is only about ten per cent of the weight of the potatoes. The peels are very valuable for hog feed. The peeled potatoes must be kept under water to avoid darkening until they can be sliced. Most of the slicers used are automatic and have great capacity. Figure 53 illustrates a small vegetable slicer for community installation.

The sliced potatoes are then blanched in boiling water for about three minutes to destroy the oxidase which would otherwise cause the potatoes to darken and develop a disagreeable flavor. The same effect can be obtained by exposing the potatoes to steam instead of boiling water. Certain plants are equipped with a continuous steaming box which reduces the labor cost. The blanched vegetables are then separated on trays and sent to the dryer.

Beets should be boiled or steamed until the skins will slip readily. Onions are blanched in water for a few seconds to loosen the outer husk, but not long enough to heat the interior. They are then sliced and dried without blanching. Turnips, parsnips, carrots are usually peeled in a mechanical peeler similar to the potato peeler or peeled by hand, sliced, and dried without parboiling. Cabbage and cauliflower are sometimes blanched by exposing them to steam for about three to five minutes. Other dryers of vegetables dry these products without blanching or steaming. The blanched product is usually more tender and somewhat darker in color. Sweet potatoes can be dried very satisfactorily. They are usually cut in quarters or in half and blanched until heated through in boiling water. From six to eight minutes is sufficient for this purpose. Summer squash and eggplant are dried without blanching. Pumpkin and Hubbard squash will have a better appearance if dried without blanching, but the flavor and texture are better if they are cut in slices and blanched for a short time in steam or boiling water. Tomatoes are dropped in boiling water for about one minute and then chilled in cold water and peeled. They are then sliced about one-quarter of an inch thick and spread on trays. The sliced product should not be blanched. Peppers and pimientos are not blanched. The pods are cut at the stem end and a slit or two made in them to facilitate drying, or the pods are cut in half. Corn is one of the most satisfactory of dried vegetables. The corn on the cob should be blanched in boiling water long enough to coagulate the milk. Eight to twelve minutes is required. It is then chilled, cut from the cob and spread on the

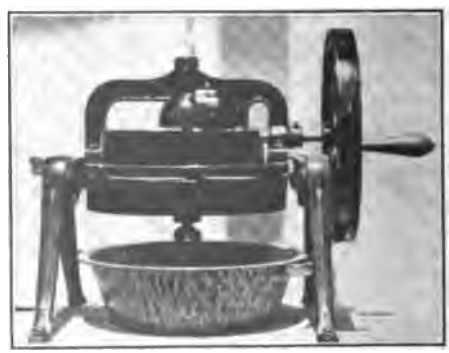


FIG. 53.—An approved vegetable slicer.

trays. String beans will dry more rapidly if sliced. Both string beans and green peas should be blanched in boiling water for about five minutes. This will fix the color and make the finished product tender in texture and of very pleasing flavor. Celery stalks, celery leaves, and spinach are dried without blanching. They should be thoroughly washed, however, to remove dirt and sand.

8. Evaporation.

Vegetables are sensitive to high temperatures. Evaporation should be accomplished rather by a large volume of warm air than by a small volume of very hot air. A temperature not to exceed 150° F. should be used. Many vegetables, if kept at a temperature above 150° F. after they have become dry will become very dark in color and develop a very disagreeable scorched or burnt flavor. The vegetables should be removed from the evaporator as soon as thoroughly dry because of the deleterious changes which take place after the product has become thoroughly dry. The temperature in the evaporator at the start of evaporation should be between 120° and 130° F. If the temperature is too high and the air blast too vigorous the moisture can not diffuse from the interior of the vegetables to the surface as fast as it is removed by the evaporator. This results in "case hardening." This means that the surface of the vegetable becomes coated with an impervious membrane which practically stops evaporation and results in the cooking of the vegetable rather than its drying. This condition is avoided by the use of rather low temperature at the start of evaporation.

The dried product should contain less than ten per cent moisture. This usually means that the product should be "bone dry" when it is taken from the evaporator; that is, hard and brittle. The government specifications require that potatoes for army use shall contain less than ten per cent moisture. Other vegetables must contain less than eight per cent moisture. It has been found that higher moisture content leads to molding.

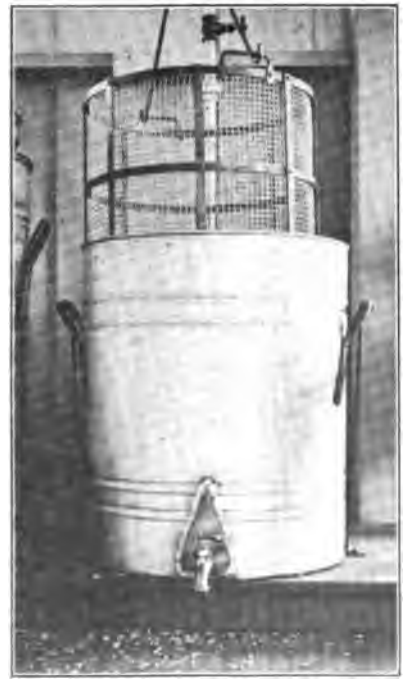


Fig. 54.—Blanching vat for vegetables. This is for a community size evaporator.

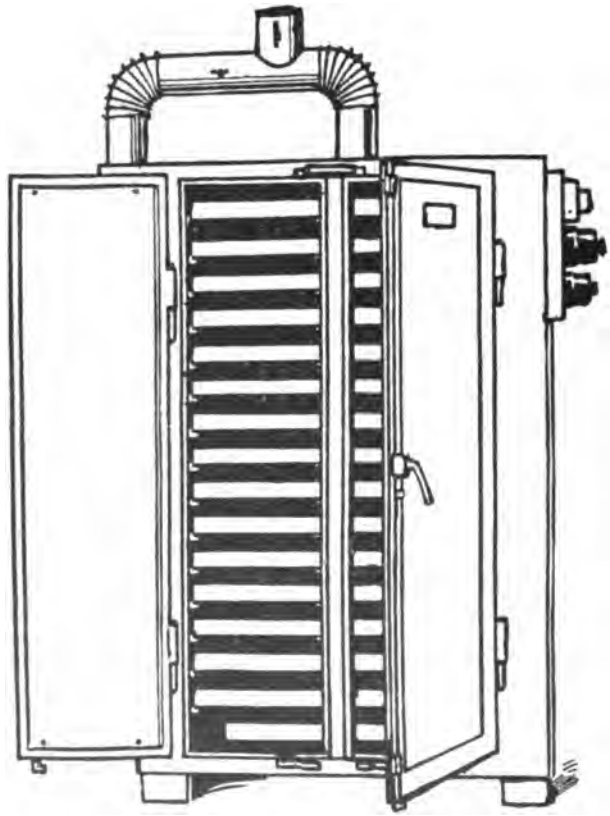
9. Packing and Storing.

The dried vegetables should be placed in insect-proof containers as soon as they come from the evaporator. The package should also be more or less moisture-proof in order that the vegetables will not take up moisture in the package. Two styles of packages are used; one of these is the ordinary paper carton used in packing raisins or other dried fruits. The carton is lined with paraffin paper and often the package is sealed by dipping the ends in melted paraffin. Certain carton manufacturers in the United States turn out a special package which is heavily impregnated with paraffin. This style of container is rather expensive, but is very satisfactory. Potatoes for government use have been put up in large tin cans that are sealed watertight for shipment to France. A tin can is probably the most satisfactory of all containers. Dried vegetables, when kept in the kitchen, should be stored in closed cans, ordinary coffee or Crisco cans or similar styles of cans being very satisfactory. The dried vegetables are not very sensitive to ordinary changes in temperature. Freezing weather or hot summer weather will not seriously impair their quality if they are stored in tight containers.

10. The Future of Evaporated Vegetables.

There will always be an appreciable market for dried vegetables in mining camps, in Arctic regions, and for the use of sailing vessels and for army posts that are situated at a distance from civilization. These consumers would, however, never

use a large quantity. It is very difficult to predict whether the evaporated vegetable industry will grow or even maintain its present size, but dried vegetables have certain very important advantages over the canned and even over the fresh product. If the American housewife can be persuaded to use them during the winter months, there should develop a very considerable market for them. The attaining of this condition will necessitate very extensive advertising. It will also mean that the products will have to be standardized and the high quality maintained. Much of the dried product now available is extremely variable in quality. If the civilian population is to take up the use of dried vegetables, the present quality of the product must be greatly improved. The price of the product must also be fair and moderate. In the writer's opinion, it is doubtful whether California will ever come to the extensive use of evaporated vegetables, but the eastern half of the United States and Canada should in time be made to see the advantages that these products offer. The United States Department of Agriculture recently has been granted a very large appropriation for the development of methods of evaporation and for the introduction of evaporated products upon the American markets. This work is in charge of Lou D. Sweet, H. C. Gore, and J. S. Caldwell. These men are doing a very good work and the results of their efforts will be watched with interest.



An electric evaporator.

The above evaporator, designed in Switzerland for drying fruits and vegetables, has been in use successfully since 1917. As shown in the figure, it is shaped like a cupboard, well insulated, and fitted with a ventilating fan driven by a weak electric current; the bottoms and walls are provided with heating elements and a heat regulator.

The evaporator in the figure contains 32 trays holding 264 pounds of apples or 220 pounds of vegetables. From 7 to 24 hours are required in the drying operation.

This dryer has been run continuously over long periods and in five months processed the following: 6,600 pounds of apples, 660 pounds of prunes and 17,600 pounds of vegetables.

AGRICULTURAL PATROLS BY AIRPLANE.[1]

AERIAL WORKERS IN PINK BOLLWORM ERADICATION CAN SEE OUTLAW COTTON FIELDS IN TIMBERED AREAS.

The airplane now has come to help agriculture, not as the tractor undertook to supersede the horse, for drawing plows and the like. The airplane comes into the agricultural field as a scout, and the only duty thus far assigned it is to spy out hidden cotton fields.

In southern Texas, where the devastating pink bollworm of cotton has been trying to invade the United States from Mexico, there are cotton-free zones, declared by law as barriers against the progress of the worm. But a few misguided farmers feel that their rights have been infringed and have developed a tendency to become outlaw cotton planters. Much of the country is heavily timbered. Roads are neither plentiful nor good in many places, and it has been possible for an outlaw planter to tuck away a few acres of cotton in some nook of the woods beyond probability of discovery by ordinary means, though the United States Department of Agriculture was making diligent effort to spot every stalk of cotton in the quarantined areas.

FINDS OUTLAW FIELDS BY PLANE.

Last year the department, through workers of the Federal Horticultural Board who were on the ground, took advantage of an offer to try out the airplane for scouting work. In this way Inspector Hensley of the board discovered seven outlaw cotton fields in the heavily wooded country along Trinity River and around Galveston Bay which had escaped discovery by all other means.

Similar exploration and control work, conducted last fall and this winter, was aided by a detail of Second Lieutenant Harold Compere, of the Aviation Service of the Signal Corps of the Army. Lieutenant Compere of the Office of the California State Commissioner of Horticulture is a son of George Compere, also of the State Commission, and one of the world's great entomological explorers, who for many years has been connected with the plant quarantine and inspection service of California and also acting as a collaborator in plant inspection work for this department.

Lieutenant Compere has been at Ellington Field, Houston, Texas, in the center of the cotton-growing district infested with the pink bollworm, and has become familiar with the general needs of the survey work. After discussing the possibilities with Dr. W. D. Hunter, a member of the Federal Horticultural Board in charge of the field work against the pink bollworm in Texas, Lieutenant Compere became convinced that practical use could be made of his training as an aviator in connection with his scientific interest and training in entomology, and that the airplane would tremendously facilitate the scouting for the location of cotton fields, both within and outside the quarantined areas. This territory includes wide stretches of more or less swampy forested tracts, in which occasional small patches of cotton are being grown, and which in the dearth of roads and resulting inaccessibility are very difficult to locate.

HELP FROM WAR DEPARTMENT.

Mr. Compere made an application to the commanding officer of Ellington Field for permission to engage in such work. This request was disapproved, but with the suggestion that the request should be referred, with the endorsement of the Department of Agriculture, to the Division of Military Aeronautics, War Department. This was done, with the result that Lieutenant Compere has received from the War Department full authority to undertake the work of locating cotton fields in the observation zone, and this work was actually begun January 14, Mr. Hensley again accompanying the aviator to make the observations and, particularly, to prepare photographic maps of the entire district between the Brazos and Neuces Rivers in Texas, which is being kept under survey and observation.

About a week later, Lieutenant Compere received his honorable discharge from the National Army, but before leaving he selected an aviator from the Ellington Field

[1] Adapted from U. S. Dept. of Agric. Press Bulletin.

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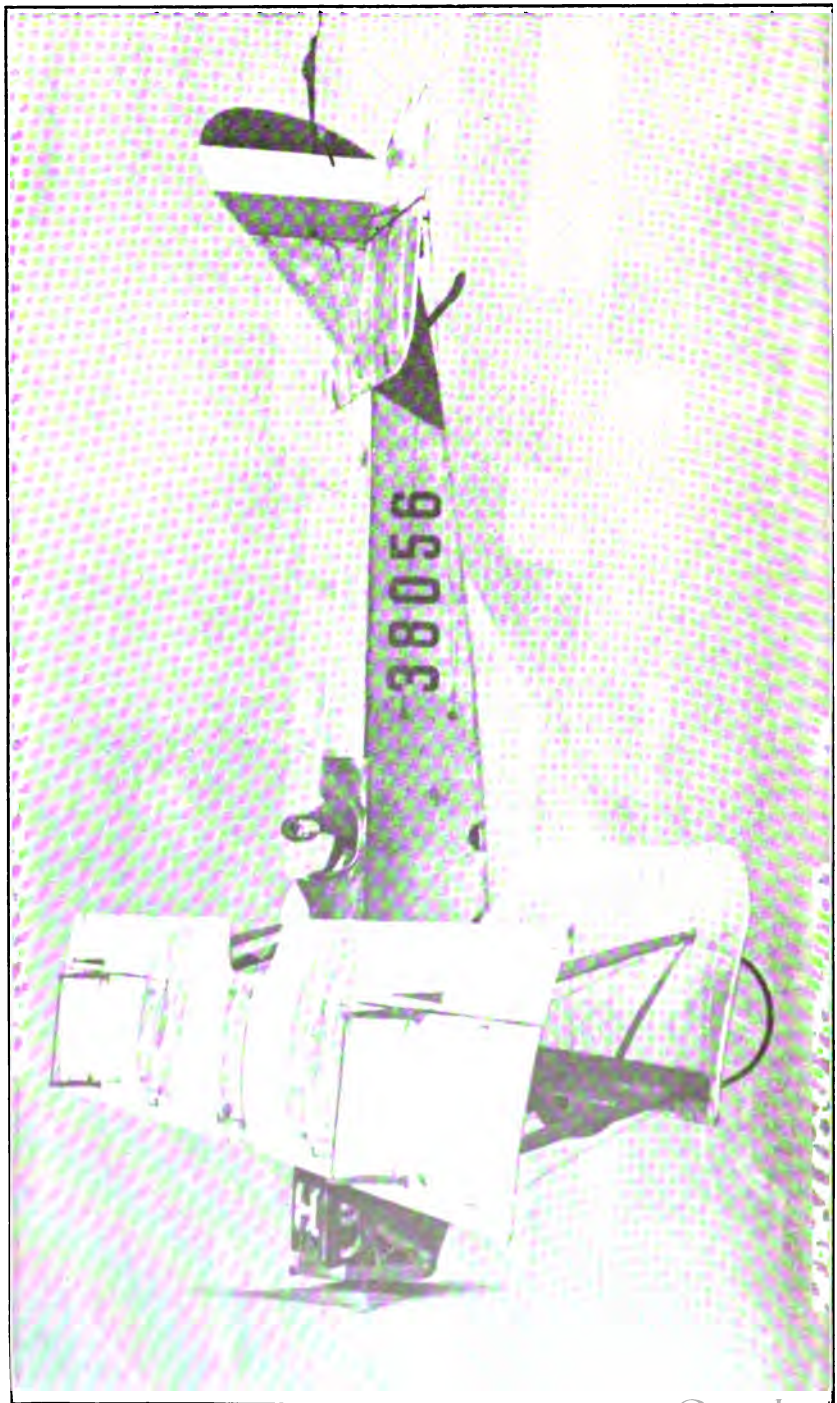

FIG. 55.—Although at an altitude of one mile, the "outlawed" cotton plantings accurately may be located and mapped. This photograph was taken from a companion machine which was traveling at the same rate of speed in the same direction.

service to take his place, Second Lieutenant William H. Tillisch, and the work has been in regular progress since the 14th of January. For the most part, Inspector Hensley is accompanying the aviator. Two flights were made on January 1 by Mr. Carl Heinrich, an expert of the board for the purpose of obtaining a panoramic view of the territory bordering the quarantine lines to note the character and extent of any forests or wooded areas which might act as a natural barrier to the spread of the pink bollworm by flight of the moth, as well as to secure some idea of the value of aerial observation in connection with entomological scouting and mapping.

COUNTRY MAPPED FROM THE AIR.

Mr. Heinrich reports that the flights were made at an altitude of from 1,500 to 2,000 feet. At this elevation on a clear day a distant vision could be had of the country over a range of 30 miles, and cultivated fields, buildings, shell roads, railway lines, creeks, and the character of the wooded areas, whether pine or deciduous, could be easily distinguished. At the normal speed of the airplane—75 miles per hour—the ground moves so slowly that the observer has time to get a complete picture of the area and to easily distinguish cotton from cornfields.

After reporting in detail on the natural barriers found, Mr. Heinrich is enthusiastic in the belief that the airplane will tremendously facilitate all such scouting and reconnaissance work, including mapping. Photographs can be made which can be assembled into a detailed map in a very short time compared with ground surveys by means of motor or other conveyances. Such surveys would be particularly useful in scouting territory like that of the upper Rio Grande Valley, where cultivated areas and cotton fields, if existing, are widely separated and the roads in many cases practically impassable and, furthermore, where the distances are so great that enormous loss of time and labor would be involved in any other method of survey. In just such work as that necessary in this pink bollworm survey and scouting, the airplane will be exceptionally serviceable.

USEFUL IN AGRICULTURAL SURVEYS.

Similar use can be made of it in other agricultural and forestry surveys, which are analogous to the similar mapping and survey use made of it for war purposes.

The test of last year, followed by this more important and systematic utilization of this new means of survey and inspection, marks probably the first use of the airplane in a practical way in agriculture and may be the starting of an important use of this new means of transportation and observation for scouting and inspection purposes in other fields of research or control work.

Power sprayer at work in tidewater, Virginia.

While this ingenious machine was constructed for use against the onion thrips, its great range of usefulness against other pests in beet fields, etc., where close planting does not admit of machine or team work, may be seen readily. This type of machine will spray a strip 80 feet in width. (From Chittenden, U. S. Dept. Agr.)

SPRAY VERSUS FUMIGATION IN THE CONTROL OF GRAY SCALE ON CITRUS TREES IN TULARE COUNTY.

By F. R. BRANN, Lindsay, Cal.

During the past five years there has been a great deal of controversy pro and con regarding the relative merits and demerits of the various spray formulas and fumigation for the control of the gray scale (*Coccus citricola* Camp).[1]

FIG. 56.—The gray scale (*Coccus citricola*).

The details governing the proper use of spray formulas on citrus, are numerous, and the average grower, not being familiar with these details, often falls an easy victim to the representative salesman.

There has been a great variety of arguments, many of an outlandish nature, to induce the citrus grower to use certain spray formulas, and representatives are soliciting spray work practically throughout the whole year.

[1]This scale was first discovered in 1909 at Claremont, California. It was then thought to be *Coccus longulus* (Dougl.), and a short article on the species under that name was published in the Pomona College Journal of Entomology, Vol. I, pp. 31-32, 1909. This gave rise to the common name, "longulus scale," which is now a misnomer and which has been changed to the "gray citrus scale." The name "false soft brown scale" is not applicable, as there is a *Coccus pseudohesperidum* (Ckll.).

On the other hand, fumigation has been voluntarily adopted by a large percentage of the experienced, and progressive citrus growers, on the strength of its merits, and on the advice from our State University experts and state and county horticultural officials. Comparatively little soliciting for fumigation has been done, and only during the late spring and summer months.

The investment necessary to operate as a sprayer is very light compared with that for fumigation, consequently, many have entered the field as commercial sprayers prompted mainly by commercial gain.

The Horticultural Commissioner and his local inspectors are always willing and anxious to advise the use of a method which has been thoroughly proved to be advantageous to the grower, and equally willing and anxious to protect the grower to the extent of their authority against fake methods and harmful formulas which may prove detrimental if used.

The placing of the various methods and formulas in their proper category requires time and close observation, consequently the Horticultural Commissioner and his inspectors are reluctant to advise regarding new formulas until the results are fully determined.

The wide-awake grower will not "experiment" with a new formula on an acreage scale as a few trees will show the results just as well, if given time, and probably at a tremendous saving.

The paramount issue regarding the use of a certain treatment on citrus is: Does it constitute an investment to the grower who uses it? How shall we determine this? How many years does it require? And who shall pay for the experiment? These last questions are of most vital importance, and I do not believe that we can dodge them.

There have been many spray formulas offered for the control of the gray scale on citrus, during the past four years, none of which have yet proven to be as efficient or cheaper than fumigation. The reasons for this are very evident.

We have but three methods of artificially controlling insect pests, and one natural method—viz:

1. Arsenical—poisoning through the digestive organs.
2. Contact—chemical dissolution of body tissues.
3. Fumigation—direct killing by deadly fumes, or producing unpleasant living environments.
4. Biological—employment of natural parasites.

It is necessary that we acquaint ourselves with the habits, especially the eating and hatching habits of the insect pest which is troubling us, in order to determine which of the three artificial methods we should use as a means of control.

Here we must consider another factor of most vital importance: What effect will the treatment have upon the citrus plant itself?

After classifying the insect regarding its eating and hatching habits we find it just as essential to classify the various chemicals regarding their effect on citrus vegetation.

We find that arsenate of lead acts as a stimulative poison on citrus. Oils are injurious to the citrus leaf because of the tendency to close up, or seal over the leaf cells, reducing the functioning power of the leaf in the admitting of carbon dioxide. Oils containing acids produce very severe injury, but even though the acids are removed, it is not beneficial to the citrus leaf to have on its surface any material which would have a tendency to retard its functioning powers.

Another consideration we cannot afford to overlook is with regard to the beneficial insects, so valuable to our orchards and farms. Arsenical sprays are very likely to destroy beneficial insects or produce disagreeable living environments, thus allowing its host, if a sucking insect, to increase unhindered.

Scale insects possess a hair-like tube for sucking plant juices, consequently are not affected by the surface application of arsenate of lead, bluestone, paris green, etc. The mouth parts of many of our beneficial insects are constructed for biting and chewing and thus are capable of admitting surface arsenical poisons. Arsenate of lead is of extreme value for controlling certain insect pests on deciduous stock, and gives wonderful efficiency if used at the proper time, but is generally out of place when used on citrus.

I will herewith give some data which I personally secured from two orange groves in the Lindsay district on which arsenical sprays were used:

A certain spray formula containing as a base arsenate of lead and copper sulphate (bluestone) was applied twice as a spray on a 10-acre grove of ten-year-old Wash-

ington Navel and Valencia trees. One application was made early in June, 1916, the other in September, 1917. On February 25, 1918, the trees were grossly infested with cottony cushion scale (*Icerya purchasi* Mask.) from the ground up the trunks and to the outermost twigs, not merely a few trees here and there infested in this way, but on all trees throughout the grove. Not a live Vedalia could be found after a thorough search. After the heavy rains of February and March, I again searched the grove but could find no Vedalia. On March 25, I received two tubes of adult Vedalia from the State Insectary, at Sacramento. These tubes contained 50 and 75 Vedalia, 5 of which were dead. I released the 120 valuable little beetles in the grove, distributing them pretty well over the entire ten acres, and on June 17, 1918, practically all cottony cushion scale were dead.

The fruit on this ten acres was very severely "smutted" from the residue of the scale and had to be washed before packing.

This ten acres is the south half of a 20-acre grove, the north half of which was not sprayed. The whole acreage was worked as one grove with no avenue separating, yet no cottony cushion scale appeared on the trees of the north ten acres. On the south and west the orange groves adjoining were not sprayed, and were not infested with cottony cushion scale.

But the severe infestation of cottony cushion scale was not the only trouble on this ten acres. A still more serious condition resulted from the use of this spray. The leaves dropped until one could see through the trees plainly, and at the present date the trees have not shown signs of improving. I invited Prof. H. J. Quayle of the Riverside Experimental Station to inspect this grove on June 26, 1918, and he stated it was one of the most severe cases of infestation by cottony cushion scale he had ever seen.

Another grove of ten-year-old Washington Navel trees was sprayed late in February, 1917, with an arsenate of lead and copper sulphate solution, five rows in the center of the grove being left unsprayed. On the sprayed portion, during the blossoming period, enormous numbers of aphids were present, and seriously hindered the setting of the fruit, while on the five unsprayed rows, there were very few aphids and these trees produced nearly three times as much fruit per tree as did the sprayed portion.

This condition was a result of the lead arsenate killing the common red ladybird (*Hippodamia convergens* Guer.) allowing the unhindered development or propagation of the aphid. Afterward the sprayed trees became quite defoliated on the south sides but the five unsprayed rows appeared perfectly normal and did not drop their leaves. Both of these growers told me that if they had known what effect the spray would have, they could not have been hired to use it!

I am prepared to give data on numerous other cases where severe loss of fruit production and tree injury resulted from the use of arsenical sprays.

The average grower little realizes the tremendous value of the common red ladybird (*Hippodamia convergens*) in controlling aphid. Both the black citrus aphis and the green peach aphis will, if not controlled, reduce seriously the fruit crop of citrus, by weakening the young blooms through their juice-sucking attacks.

The oil sprays are not being used in this district to any degree, for most of the growers are "wise to it" and have it properly classified. Practically the only oil used on citrus today is the small amount which is used with lime-sulphur. There is a considerable amount of lime-sulphur spraying on citrus at the present time and it is due to the following reasons, that so many growers are utilizing it:

First, It does not cause tree injury, if used during cool weather.

Second, On account of the exceptional weather conditions of the season 1917.

Third, The initial cost is less than fumigation.

Of course there are numerous other reasons such as "My neighbor said he got good results," "I am going to use it as a combination against scale and thrips," "It disinfects the trees," and "Mr. Blank of southern California told me they use nothing else down south," etc.

The natural death rate of the citricola scale during the summer of 1917 was enormous, being far greater than in any previous year and splendid results could be obtained in so far as scale killing was concerned with almost any kind of material. In fact commercially clean results occurred on many groves throughout the district where no treatment at all was given. If a treatment had been used on these groves it naturally would have received the credit of the full efficiency.

Regarding the relative cost to the grower of spraying and fumigation: You will often hear the remark that "Spraying is cheaper than fumigation." This is very vague and should be modified considerably. Many of the growers of the Lindsay

district have found spraying very much more expensive than fumigation when tree and crop injury was considered. The degree of efficiency, amount of tree injury and other results depend upon the formula used, date of application and the manner in which it is applied.

The cost of controlling the citricola scale should be considered by the grower as "overhead expense," for it is, as yet, a physical impossibility completely to eradicate this pest. The best that can be done is to control it and thus put our groves in what we term a "commercially clean" condition. Therefore, in order correctly to figure the cost of a given treatment, we must do so on a "continual basis."

I agree that one application of spray is cheaper to the grower than is one fumigation provided no tree or fruit injury results from the use of the spray. This is counting merely the cost of material and labor, plus the profit to the operator. The real consideration is that of the degree of efficiency attained. One fumigation usually places a grove in a commercially clean condition for from two to four years during which time the grower can reap the benefits of trees producing under clean conditions. The average degree of efficiency to be derived from spraying would necessitate from three to six applications during this time, which in cost would be much greater to the grower and the trees probably not be producing under clean conditions during this time.

Of course there is usually considerable difference, both in cost and efficiency, whether the spraying is done by the commercial sprayer or by the grower himself. The grower naturally would do the work to the best of his ability. There are cases of fumigation work of very low efficiency, but fortunately these cases are decidedly in the minority.

Taking the total acreage sprayed and fumigated in Tulare County from year to year, the following figures tell us considerable:

Fumigation			Spray		
Year	Acreage	Approx. cost	Year	Acreage	Approx. cost
1914	1117	$29,859 00	1914	233	$4,190 00
1915	2018	54,486 00	1915	750	13,500 00
1916	3530	95,310 00	1916	1252	22,536 00
1917	4060	109,620 00	1917	2293	41,274 00
1918	700	24,500 00	1918	1240	22,320 00

NOTE.—Spraying is still being done. These figures are only for work done to September 1, 1918.

The figures under approximate cost are for material, labor and operators' profit.

Of a total of 11,425 acres fumigated in Tulare County during the period 1915 to 1918 inclusive, only four cases came to my knowledge where, through low efficiency, consideration of adjustment was necessary. These four considerations totaled slightly over $200 on a total of 50 acres.

Of the total acreage of 5,768 sprayed in Tulare County during this five year period dissatisfaction was considerable. From 27 growers whom I interviewed personally I found that on properties aggregating 238 acres a total estimated damage of $48,600.00 actually occurred. I believe I am conservative in my estimate of $100,000.00 loss in Tulare County from the use of sprays in addition to the loss of time, and cost of application. In a number of cases legal proceedings would have been undertaken by the growers had it been possible to recover costs.

In 1917 liquid hydrocyanic acid gas was first used in the Lindsay district for fumigation on a total acreage of 475, cyanofumers being used on a total acreage of 3,585.

In 1918 season found no cyanofumer work and about 700 acres were fumigated with liquid gas. The new liquid-gas method appears to be the last word in fumigation, having the earmarks of a great improvement over all former methods.

The writer is at present engaged in the final inspection and examination work of the liquid-gas fumigation in the Lindsay, Exeter and Porterville districts, and will have a report to make giving results as he finds them.

THE VIGOROUS OLIVE IN CALIFORNIA.

The planting of olive stumps instead of young nursery trees has been tested experimentally a number of times. The above photograph shows the growth made from an old stump at 20 months after setting. This stump was completely denuded of root growth at the time it was placed in the ground.

ECONOMIC POISONS USED IN CONTROL OF PESTS IN CALIFORNIA.

Season 1917–1918.

By GEO. P. GRAY, Berkeley, Cal.

Two and one-half millions of dollars was the estimated cost of economic poisons[1] used in California in 1916. This estimate was based upon reports from 28 county horticulture commissioners, representing about 71 per cent of the bearing acreage of fruit in the state.[2] The cost for the season of 1917-1918 is estimated at nearly three millions of dollars. This estimate is based upon the more nearly complete returns of 41 commissioners compiled in the following report.

The collection and compilation of these figures for 1916 were undertaken as a "war measure" and were made possible by the hearty co-operation of Mr. G. H. Hecke, State Commissioner of Horticulture, and by the interest shown by the county horticultural commissioners. The information obtained by the first report appeared to be of such great interest and value to those concerned that it was agreed to continue the co-operation in an endeavor to obtain a more complete response from the 48 county commissioners, and possibly to make it an annual affair. In order more completely to coincide with the spraying and fumigating season it was decided to collect statistics for the year ended June 30, 1918, instead of for the calendar year, as was done in 1916.

Reports were received from 39 counties for the year ended June 30, 1918. Two important horticultural counties failed to report this year, but had reported for 1916, so the old reports have been included in the present estimates. The reports from these 41 counties represent 94 per cent of the bearing acreage of fruit (including nuts and hops), or 90 per cent of the total acreage of principal fruits and certain farm crops in forty-eight counties as reported in this Bulletin.[3] While it is recognized that some of these reports, both acreage and poison, are not as carefully compiled as could be desired, it must be recognized that the figures presented herewith are far more nearly complete than are those for 1916. The writer fully appreciates the great amount of time and energy spent in the accumulation of the statistics and takes this opportunity to express his sincere thanks to the county commissioners who have made possible a compilation representing such a large proportion of the farming area of the state.

The data are presented in two ways: Table I showing the cost of economic poisons by county; and Table II showing the total reported consumption, average price and cost of the various materials.

The acreage figures in Table I are taken from Weldon and Newman's table.[4] It seemed of interest to know the total cost per county as well as to have a rough estimate of the average per-acre cost for the control of insects and plant diseases on those crops which are commonly sprayed or fumigated. To obtain this estimate, the bearing acreage of fruits, nuts, and hops was computed for each county and is shown in the second column. The figures in the third column were obtained by deducting from the total cost of economic poisons for each county, the amount reported for white arsenic, coal-tar dips, formaldehyde, carbon bisulfide, iron sulfate, corrosive sublimate, commercial strychnine-coated grain, strychnine alkaloid and sulfate, saccharine, gopher poisons, and various other items which are not commonly used in the control of orchard pests. The estimate of the per-acre cost for each county is obtained by dividing the cost by the acreage. The figures in the last column of Table I were obtained in a similar manner, except that the total reported acreage of crops and the total cost of economic poisons were used.

It is clearly evident that these estimates cannot be taken literally. Their validity, however, is dependent solely upon the accuracy of both the acreage and the economic poison reports. Only for those counties from which accurate and complete reports are available, are the estimates of significance. It is thought, however, that the estimate of $4.30 may be taken as a general idea of the average per-acre cost for the control of insects and plant diseases of fruit in California. As for the other

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[1] Materials used for the control or eradication of insects, fungi, weeds and rodents.
[2] Monthly Bulletin, Cal. State Commr. of Hort., Vol. 7, No. 3, p. 140.
[3] Monthly Bulletin, Cal. State Commr. of Hort., Vol. 7, No. 4, p. 216.
[4] Monthly Bulletin, Cal. State Commr. of Hort., Vol. 7, No. 4, p. 216.

figures in Table I, the reader may draw his own conclusions without prejudice from any comments by the writer.

The data in Table II are the most complete figures of this sort which have been compiled for this state and probably for any state. It is especially gratifying to note that the reports from which the table is compiled represent 94 per cent of the bearing orchards of the state, and in many cases have been more carefully prepared than those for 1916.

Figure 57 indicates graphically the relative importance of the various groups of materials. The cost of cyanide fumigation still occupies the undisputed first place, being almost exactly one-third of the total. The sulfur group comes next, the two accounting for more than one-half of the total. The activities of the Rodent Control Division of the State Commissioner's office is reflected in the expenditure of close to a quarter of a million dollars for rodent poisons, representing 9 per cent of the total.

TABLE I—*Cost of Economic Poisons by Counties.*

County	Fruits, nuts and hops. Bearing acreage only.			Principal fruits and certain farm crops. Total acreage.		
	Acres	Cost of remedies	Per-acre cost	Acres	Total cost economic poisons	Per-acre cost
Alameda	9,597	$9,377 27	$0 97	19,897	$23,335 40	$1 17
Butte	14,341	10,698 67	74	37,365	13,544 83	36
Colusa	1,870	2,605 03	1 39	28,440	3,296 47	11
El Dorado	1,568	5,335 59	3 40	3,753	5,637 08	1 51
Fresno	44,154	161,565 54	1 39	44,797	161,943 34	3 61
Glenn	1,933	3,975 25	2 05	28,533	6,490 25	22
Humboldt	2,040	1,491 40	73	12,895	1,498 54	11
Imperial	623	[2]	-------	115,694	[2]	-------
Kern	1,989	2,157 30	1 08	126,566	29,207 05	23
Kings	10,410	19,126 58	1 84	11,912	31,381 10	2 63
Lake	2,009	5,190 26	2 58	18,528	5,608 81	30
Los Angeles	59,305	1,033,925 19	17 43	383,273	1,084,759 38	2 83
Madera	2,641	4,769 55	1 80	4,570	15,482 90	3 37
Marin	340	2,117 88	6 23	3,020	2,490 86	83
Mendocino	3,575	5,961 32	1 63	11,080	7,203 61	65
Merced	7,061	7,999 64	1 13	112,169	20,231 02	18
Modoc	554	1,256 48	2 27	73,030	8,211 48	11
Monterey	3,855	4,321 00	1 12	42,038	16,955 90	40
Napa	7,630	13,596 65	1 78	14,330	14,789 65	1 03
Nevada	2,200	1,652 80	75	7,150	2,620 00	36
Placer	17,955	38,066 73	2 12	42,190	40,426 73	95
Riverside	31,324	38,703 14	1 23	210.010	39,880 62	19
Sacramento	16,403	137,599 85	8 39	188,053	141,589 85	75
San Benito	3,073	12,837 67	4 17	23,132	21,897 07	83
San Bernardino	56,657	83,269 81	1 47	140,161	85,991 08	61
San Diego	8,970	51,453 14	5 73	28,030	52,469 73	1 87
San Joaquin	9,914	4,808 94	48	101,253	7,121 65	07
San Luis Obispo	2,072	2,065 35	1 00	78,020	19,430 35	25
Santa Barbara	7,262	1,218 00	17	128.217	10,222 80	08
Santa Clara[1]	85,848	263,528 45	3 07	94,589	265,080 41	2 81
Santa Cruz[1]	18,400	91,896 70	4 99	33,925	93,349 21	2 75
Shasta	2,136	2,388 50	1 12	12,270	3,005 15	24
Siskiyou	1,106	1,232 65	1 12	93,021	8,155 65	08
Solano	15,036	39,040 61	2 59	20,151	40,009 11	1 98
Sonoma	13,787	59,956 24	4 35	87,774	61,998 36	70
Stanislaus	10 230	27,078 60	2 65	161,726	44,205 30	27
Sutter	9,655	16,038 60	1 63	60,490	16,038 60	26
Tehama	6,577	1,290 60	20	19,400	3,351 24	17
Tulare	20,481	160,073 33	7 82	48,613	186,596 00	3 84
Ventura	18,581	12,942 24	70	184,192	15,999 55	08
Yolo	12,855	7,937 94	62	94,518	10,644 56	11
Yuba	3,595	15,281 82	4 25	24,189	30,274 87	1 25
Totals	549,672	$2,365,822 31		2,975,964	$2,652,405 59	
Average per-acre cost			$4 30			$0 89

[1]Figures on consumption taken from 1916 report. Average price as for season 1917–1918 applied.
[2]Nominal.

TABLE II—*Consumption, Prices, and Cost of Economic Poisons in 41 Counties Reporting.*

Material	Consumption season 1917-1918	Average price to consumer		Cost season 1917-1918	Group totals
		1916	Season 1917-1918		
White arsenic	15,206 lbs.	$0 183	$0 356	$5,413 34	
Paris green	15,455 lbs.	0 435	0 671	10,370 31	
Lead arsenate (paste)	536,530 lbs.	0 110	0 155	83,162 15	
Dry lead arsenate	248,213 lbs.	0 225	0 330	81,910 29	
Zinc arsenite	30,056 lbs.	0 300	0 300	9,016 80	
Arsenicals					$189,872 80
Copper sulfate	659,497 lbs.	0 142	0 148	97,605 56	
Bordeaux pastes	326,515 lbs.	0 124	0 061	20,896 96	
Bordeaux powders	25,540 lbs.	0 120	0 357	9,117 78	
Copper compounds					127,620 30
Sodium cyanide	2,352,337 lbs.	0 284	0 330	776,271 20	
Sulfuric acid	5,217,910 lbs.	0 017	0 020	104,358 20	
Cyanide and acid					880,629 40
Commercial lime-surfur[1]	22,742 bbls.	9 957	11 280	257,982 10	
Commercial sulfur pastes	178,402 lbs.	0 082	0 086	15,342 57	
Alkali polysulfides	75,310 lbs.	0 080	0 080	6,024 80	
Sulfur	7,103,899 lbs.	0 037	0 047	333,859 75	
Sulfur and compounds					613,209 22
Kerosene	25,480 gals.	0 106	0 110	2,802 80	
Other petroleum distillates	138,828 gals.	0 065	0 125	17,353 50	
Crude petroleum	521,030 gals.	0 043	0 174	90,659 22	
Commercial emulsions	301,179 gals.	0 106	0 223	67,162 92	
Miscible oils	16,290 gals.	0 283	0 750	12,217 50	
Fish oil	7,314 gals.	-------	1 430	10,459 02	
Crude carbolic acid[2]	3,102 gals.	-------	0 626	1,941 85	
Coal tar "dips"	7,847 gals.	1 200	1 289	10,114 78	
Oils and emulsions					212,711 59
Caustic soda or lye	507,553 lbs.	0 070	0 153	77,655 61	
Quicklime	7,734½ bbls.	2 100	4 167	32,229 61	
Hydrated lime	250,350 lbs.	0 011	0 014	3,504 90	
Caustics and lime					113,390 12
Fish-oil soap (hard)	100,172 lbs.	0 047	0 106	10,618 23	
Fish-oil soap (liquid)	7,451 lbs.	0 067	0 140	1,043 14	
Laundry soap	1,655 lbs.	-------	0 056	92 68	
Soap powders	795,252 lbs.	0 040	0 061	48,510 37	
Soaps					60,264 42
Tobacco leaves and stems	1,585 lbs.	0 036	0 058	91 93	
Tobacco extracts	35,875 lbs.	1 033	1 093	39,211 38	
Tobacco and preparations					39,303 31
Carbon bisulfide	33,215 gals.	1 603	1 203	39,967 65	
Commercial poisoned grain	618,351 lbs.	-------	0 149	92,134 30	
Strychnine alkaloid	49,845 oz.	1 102	1 542	76,860 99	
Strychnine sulfate	13,143 oz.	-------	1 322	17,375 05	
Saccharine	5,727 oz.	-------	1 616	9,254 83	
Rodent poisons					235,582 82
Minor remedies					27,509 28
Cost of standard remedies					$2,500,093 35
Cost of proprietary preparations					152,148 95
Total					$2,652,242 30

[1]Certain amounts of dry lime-sulfur were reported. Inasmuch as this material is marketed by one firm only, it is not listed separately, but the reported consumption of lime-sulphur solution has been increased by an amount equivalent to the dry. The cost of this has also been directly added to that of the solution.

[2]Or creosote.

ECONOMIC POISONS IN CALIFORNIA.

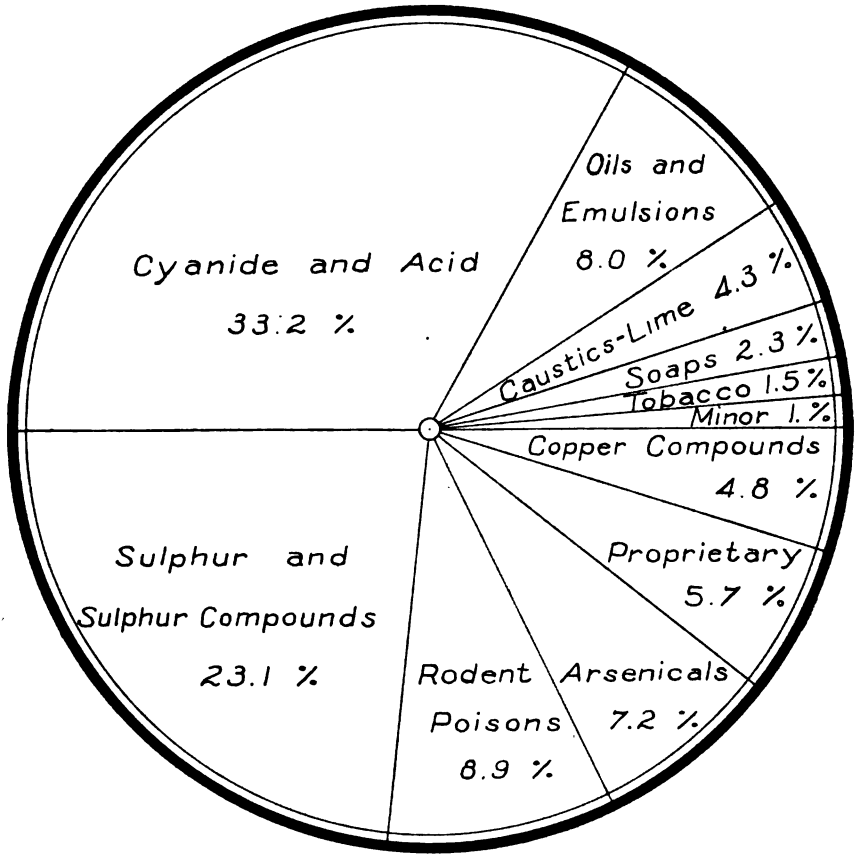

FIG. 57.—The relative quantity of economic poisons used in control of pests in California, season 1917-1918.

THE KINGS COUNTY SQUIRREL INSPECTOR.

By FLORENCE E. HEERMANS, Hanford, Cal.

The recent request of the State Commissioner of Horticulture, Mr. G. H. Hecke, through the Division of Rodent Control, that every county should be able to declare, as soon as possible, a certain area having natural boundaries, as "squirrel free," has brought to light an interesting fact regarding the campaign in Kings County. It is

FIG. 58.—Kings County squirrel inspector, Mrs. Pearl Doggett, who has won distinction in ground squirrel eradication.

that Mrs. Pearl Doggett, the only woman acting as squirrel inspector in the state, is the first to meet the requirements of the Rodent Control Division, in having reported a district of considerable area over which she has supervision which has been conceded to be commercially free from ground squirrels. This situation stands as a tribute to the work of a woman as well as a matter of pride to the county which has made such diligent effort to carry out the provisions of this beneficial law.

Mrs. Doggett was appointed squirrel inspector by County Horticultural Commissioner Fred K. Howard, when the present law became effective in 1917, and has been very persistent in her efforts to familiarize herself with all the fine points about her work, making a diligent study of the most approved methods of squirrel eradication, as well as studying other rodents and their habits. This, together with an agreeable manner of meeting and dealing with landowners in general, has won for the cause which she represents a large measure of co-operation on the part of the people and it is in no small way responsible for her success in the county.

The accompanying illustrations give some idea of this "lady inspector," who has won credit by her work in the State of California, and she is a familiar figure to the ranchers of Kings County, as she is seen driving about in her machine, which usually displays a large banner bearing the notice "GET THAT SQUIRREL," and the rancher realizes that he has to meet a practical business question, as well as a point of the law when he sees this trim little woman, attired in brown "sammiettes" making a careful survey of his premises, looking for possible homes of ground squirrels.

FIG. 59.—"Ready at all times when the call comes."

The "lady inspector" says that her success has been in a large measure due to the general system of handling the problem in the county. Kings County ranchers do not like the idea of being driven, but most of them are willing to concede that they will do their part if someone will show them that the ground squirrel can be eradicated. In this they have appreciated the efforts of the county office in demonstrating the best methods of extermination and along with this the assurance that the "neighbor's squirrels" will receive just attention. This question of the neighbor's squirrels would be funny if it were not such an all-important fact, for one little patch of neglected ground in a community affords a breeding place for enough squirrels to infest an entire neighborhood and bring to naught the most persistent efforts of any number of people who diligently poison their squirrels.

Mrs. Doggett's work is no sinecure, as may be judged from the amount of territory which she covers, having under her supervision nearly half the county or between five and six hundred square miles, in which there are few relatively large holdings, and the smaller holdings with varying crops, affording ideal feeding and breeding ground for the rodents. Mrs. Doggett carries with her a plat book of the county showing the area and ownership of every parcel of land, and in addition keeps a supply of poisoned barley with which to poison the roadways with her in her machine.

The history of warfare on the ground squirrel in Kings County dates back through the years when the Federal Department conducted a campaign of extermination. This was followed by an effort on the part of the County Board of Supervisors in 1916, when that body of practical ranchers passed the county squirrel eradication ordinance in an attempt to combat the squirrel infestation, which was becoming alarming, with the rodents making yearly depredations on seed grain, sprouting grain, and on through the season to the harvest time. The newly-grown litters were ready for the ripened grain, with attention given in the meantime to alfalfa and the drying fruit, particularly the raisins, affording variety for their menu, the latter being destroyed by the ton in every vineyard of any considerable size. The county was divided into two districts and an inspector appointed for each district.

But this method proved unsatisfactory, chiefly in that the only remedy for negligence in squirrel eradication was to have the delinquent arrested. This was found to involve many tedious processes of the law, which served to hinder rather than to aid the cause. This pioneer work, however, was not lost, as the matter was by this

FIG. 60.—A fearless exponent of the law.

and other means brought to the attention of the State Legislature, and its members, realizing the need of concerted action for all parts of the State to check this enormous annual loss, passed the present law in 1917, and charged the State Commissioner of Horticulture with its enforcement.

Seeing the trend of events, some of the County Horticultural Commissioners planned their campaigns and had much of the preliminary work incidental to intensive warfare on the rodent, well under way by the time the law became operative in July, 1917. Kings County was in this class, and Fred K. Howard, County Horticultural Commissioner, realizing that he was dealing with the most wide-awake, progressive ranchers to be found anywhere, chose as his slogan, "Lots of education, some persuasion and a little force," and began his campaign with eighteen educational meetings, held in the several community centers of the county, with F. E. Garlough of the United States Biological Survey, assisting and bringing to the meetings a thorough knowledge of the very best methods of ground squirrel extermination known to the Department of Agriculture. In this way the entire plans of the campaign were outlined and the co-operation of the land owners sought.

These meetings were followed by a county-wide service of Squirrel Eradication Notices, delivered in person by the inspectors or mailed to all absent land owners, together with a copy of the State Squirrel Law. These notices were made up in

duplicate, with the original filed in the office, while the copy was delivered to the land owner, giving the name of the owner, together with a description of the land in question, and allowing a specific number of days for the eradication of the rodents. The notices also contained excerpts from the State Law indicating the course which it would be necessary for the Horticultural Commissioner to pursue in case the land owner failed or refused to comply with the provisions of the notice, when it became his duty to cause the nuisance to be abated, and the cost of such abatement became a lien on the premises to take precedence over all other liens excepting only the lien of taxes. An interesting fact in this connection is that there were 95 per cent of signed acknowledgments of these notices returned to the Horticultural Commissioner by the land owners.

District poisoning days followed the service of these notices in which the inspectors concentrated their attention to each particular district in an effort to get every parcel of land cleaned up. This was followed by a County-wide Squirrel Eradication Week, with notices sent all land owners by post card. Later the school children were encouraged to participate in the contest for the prizes offered by the State Commissioner of Horticulture, Mr. G. H. Hecke, through the Division of Rodent Control for the largest number of squirrel tails collected as evidence of dead squirrels. The County Commissioner of Horticulture, co-operating with the Farm Bureau, arranged for four additional county prizes. These consisted of the sums of $20.00, $15.00, $10.00 and $5.00, and in addition to the State prizes made a contest well worth striving to win. One State prize was won and the county prizes were proudly claimed by the rural schools.

It has been by such persistent efforts as these that now within eighteen months from the passing of the State law that Kings County is able to declare the first squirrel free district in the State, and it is by the continuation and redoubling of such effort that the County Horticultural Commissioner and his inspectors hope to see the time when the entire County may be declared "squirrel free," and when to have a den of squirrels on one's property will be a matter of shame in the community and the guilty land owner will be in the class well known in the east, of those who harbor sheep-killing dogs.

SHALL WE DRY PEACHES RIPE OR MODERATELY GREEN?

By M. N. WOOD, Berkeley, Cal.

It seems to be a practice among growers of peaches for drying, to harvest all the crop at one time, which means, of course, that a large percentage of the crop will be more or less green. Most growers take the attitude that the quantity of dried fruit per ton of harvested fruit will be as great in case the peaches are picked moderately green as in case they are picked ripe. The California Peach Growers' Association, on the other hand, believes that a greater percentage of dried fruit will be obtained from peaches picked ripe than from those picked green.

Late in 1918 it was decided to start preliminary work at this Experiment Station to determine whether peaches picked ripe or green gave the larger percentage of dried fruit. The fruit to be dried was picked thoroughly ripe, moderately green, and very green. As no one, to our knowledge, attempts to dry very green peaches, the results obtained with the few samples of these dried are not mentioned here. It may be said that the very green peaches used were unmistakably unsuited for drying, and, therefore, are not to be considered in this article.

A comparison of the dried products obtained from ripe peaches and moderately green peaches, gave results of some value, especially in case of the Muirs. Most of the samples were sulphured in the manner generally followed commercially, and all samples were dried in the sunlight under as uniform conditions as possible. In a few cases, samples were dried unsulphured. As the unsulphured samples were so poor in color and so unattractive in appearance as to be unsalable, they may be considered as entirely unsatisfactory. In this article, therefore, only the sulphured samples will be considered.

In a few instances, in addition to being sulphured, samples of Muirs were sprinkled with a 5 per cent solution of common salt. Both the moderately green and ripe fruit samples salted in this manner gave slightly greater percentages of dried

fruit than was the case in the unsalted samples, but the evidence is not entirely certain owing to the limited number of samples used. Further work should be done next season before definite conclusions are drawn regarding the effect of salt solutions on the dried weight of peaches.

Comparison of dried fruit obtained from the ripe Muirs with that from moderately green Muirs show some interesting results. Based on the fresh weight of the whole peaches (including pits), there was a gain per ton of 23.2 pounds of dried fruit in favor of the Muirs picked ripe, as against those picked green; that is, a ton of ripe Muirs gave 23.2 pounds of dried fruit more than was obtained from a ton of green Muirs. This was the average of a number of samples of Muirs used.

While at first glance these gains seem small, they are very significant when comparison is made between the dried fruit weights obtained from ripe Muirs and those obtained from moderately green Muirs. On this basis, the results show the following:

Whenever a grower secures a ton of dried peaches from a certain weight of moderately green Muirs, he would secure 2236 pounds from a like weight of ripe Muirs, or a gain of 236 pounds per ton on dried weight. This represents the actual commercial advantage resulting from the drying of ripe Muirs against the drying of green Muirs, as based on Muirs dried at the University Farm. From a financial standpoint this means that if Muir peaches are allowed to ripen on the trees before being picked for drying, $111.80 worth of dried fruit will be obtained for every $100 worth that would be obtained if they had been picked for drying in a moderately green condition. This is a gain of 11 4-5 per cent in favor of picking ripe Muirs for drying purposes, and since this gain is on a percentage basis, it is clear that the ratio of the gain of the ripe Muirs over the green Muirs always remains the same no matter what the selling price may be. It is also interesting to compare the yields per acre of dried fruit obtained from ripe Muirs and moderately green Muirs. According to W. L. Sweet, the average yield of dried Muirs per acre in California is 2100 pounds. If a grower obtains this quantity of dried product from drying moderately green peaches, by drying ripe peaches he should obtain, according to our previous results, approximately 2348 pounds of dried product, or a gain of 248 pounds per acre. If we suppose an average selling price for the dried product to be 10 cents per pound, 248 pounds would sell for $24.80; therefore the grower would gain $24.80 worth of dried fruit per acre by letting the Muirs ripen on the trees.

In addition to the Muirs, ten other varieties were tested, the dried product in each case being procured from ripe and moderately green fruit, but owing to bad drying weather occurring late in the summer, conclusive results were not obtained for all the varieties. The average of all varieties dried gave 19.4 pounds more of dried fruit from each ton of ripe fruit than was obtained from each ton of moderately green fruit. Making the same comparisons as were made in case of the Muirs, basing them on the dried fruit obtained, 2063.2 pounds of dried fruit was obtained from peaches dried ripe as against 2000 pounds from the same quantity of moderately green peaches, and for every $100 worth of dried fruit sold from peaches picked moderately green $104.66 worth would be sold from the same quantity of peaches picked ripe. It will be seen that the average gain in these varieties was much less than was the case with the Muirs.

Samples of the dried peaches were analyzed for moisture content and dry matter. Dried fruits obtained from the ripe peaches contained slightly more dried matter than those obtained from green peaches, which shows that the dried fruit resulting from the drying of a ton of ripe peaches exceeds in weight that resulting from a ton of green peaches because the ripe peaches contain more dry matter and less water than green peaches, a fact which is of considerable interest both to the grower and consumer.

In every instance, the dried fruit obtained from the peaches picked ripe was more attractive in appearance, of better color and of a better texture than was that from the peaches picked moderately green. Furthermore, the dried fruit obtained from the ripe peaches was of better flavor and tasted sweeter than that resulting from drying the moderately green peaches.

From both the consumer's and producer's standpoint, then, the evidence thus far obtained is in favor of allowing peaches to ripen well before they are dried. Before the results are regarded as conclusive, however, the experiment should be continued for a longer period of time with a larger number of samples of varieties obtained under more varied conditions than was possible last season.

SOME EFFECTS OF HIGH TEMPERATURES AND HUMIDITY UPON THE KEEPING QUALITY OF BARTLETT PEARS.

By R. H. TAYLOR and E. L. OVERHOLSER, Berkeley, Cal.

INTRODUCTORY.

The writers were prompted to undertake the experiments outlined below as a result of an article written by Shamel[1] (1)[2] and published in a previous number of The Monthly Bulletin. In this article Shamel stated that a box of hard, ripe Bartlett pears were placed in a lemon storage room where the temperature ranged from 79° to 100° F., with an average of 83.5°; and where the relative humidity varied from 85% to 96% with an average relative humidity of 85%. The pears were subjected to these conditions on August 4, 1916, and taken out on September 3, 1916.

Even though surrounded by these comparatively high temperatures, the pears remained hard and green until the end of the experiment, or for a period of thirty days. Within six or seven days after being removed the pears ripened normally and were excellent to eat. As a check, Shamel compared the above pears with other lots which had been stored in a room of a dwelling where no attempt was made to control the temperature or relative humidity, but one would assume both these factors would be lower than in the lemon house. Pears from this family storage room were ripe within a week, or by August 10.

Shamel expressed the opinion that the "condition of high relative humidity was a controlling factor in retarding the ripening of the pears." He further states that "it is almost unbelievable that pears can be held for 30 days at the high temperatures recorded, without ripening or deteriorating."

Shamel's observations seem startling when considered wholly from the viewpoint of experience in the employment of cold storage for the purpose of delaying the ripening of fruit. On the other hand, they seem to be in accord with certain observations which indicate that high temperatures, as well as low temperatures, tend to retard the ripening process of fruit. In this connection the following observations of the writers are of interest:

When certain varieties of plums and cherries, early in their development upon the trees, are enclosed in closely-woven, black sateen cloth sacks, there is a delay of four or five days in the attainment of maturity and a prolonging of the period of edibility of from five to eight weeks after the crop of exposed fruits is normally harvested and eaten. (2) At the time these data were published, it was believed that light exclusion was the responsible factor, but in the light of Shamel's observations, it might have been high temperatures and high relative humidity in the area surrounding the fruits as a result of the covering of black sacks, the black cloth absorbing the heat rays and lessening the loss of moisture from the fruit.

Pears in the Vaca Valley, near Vacaville, Cal., have behaved in a way to indicate that high temperature may retard ripening. Although the Vaca Valley is famous for its early fruits, especially cherries and apricots, it is a well established fact that Bartlett pears grown there are notably later in reaching maturity than those from any other section of northern California, unless it be from the mountain sections where the seasons are very late in opening, due to their high elevation. One of the writers[3] has often seen a full crop of immature Bartlett pears still hanging on the trees in this valley when practically the entire crop was gone from orchards in both coast and interior valley sections. In the spring the pear trees blossom comparatively early, as do the other fruits. The young pears develop normally until the hot summer weather predominates, when they apparently almost cease growth and remain semidormant until cooler fall weather comes. Then the pears seem to commence growth again, often increasing noticeably in size and ripening in the normal way. It should be noted, however, that while the summer temperatures in Vaca Valley are generally unusually high, the relative humidity is practically always comparatively low.

[1] "Some observations upon the relation of humidity to the ripening and storage of fruits," by A. D. Shamel, Monthly Bull., Vol. VI, No. 2, Feb., 1917, pp. 39-41.

[2] Numbers in parentheses refer to "Literature Cited," p. 125.

[3] Observations made in Vaca Valley during the growing seasons since 1912 by R. H. Taylor.

In discussing Shamel's interesting results and the results obtained by the writers, later recorded in this paper, Whitten of the Division of Pomology, University of California, recalls observations which apparently bear upon this subject. He comments as follows:

> During the summer of 1901 there prevailed in the Mississippi Valley the most severe drought and the highest temperatures recorded for that section since the United States Weather Bureau was established. During that season pears remained firm on the trees much later than in normal years. In numerous instances varieties were exhibited at fall and winter fruit shows in Missouri, weeks later than the same varieties ordinarily keep for exhibition. Similar retardation, but to a less degree, of the development of pears, in the same section, has been observed to occur during occasional subsequent dry, hot summers.
>
> The casual explanation, usually offered at that time, was that the development of the pears was retarded by unfavorable conditions for growth and that this retarded development resulted in later ripening. The results of investigations initiated by Shamel seem to justify the further interpretation that tardy ripening during unusually hot summers may have been due to the high temperatures opposing the ripening process.
>
> Clusters of grapes, enclosed in sacks during their growing period, ripen later and keep decidedly longer than do similar grapes not protected by sacks. Their longer keeping has been regarded as being due to protection afforded by the sacks from injurious agencies. It is now possible to assume, however, that the higher temperature within the sack, may account, in part, at least, for both later ripening and longer keeping qualities.

In view of Shamel's report and the degree to which it seemed to be substantiated by minor, similar experiments and observations of the writers, it was decided to conduct the preliminary experiments outlined in this article. While Shamel believed it was the high relative humidity which was the controlling factor in retarding the ripening of the pears, nevertheless the factor of high temperatures was also present, hence an experiment was outlined to endeavor to determine whether high temperatures or humidity or both were responsible.

METHOD OF PROCEDURE.

To obtain for the test what appeared to be the more important combinations of temperature and humidity, compartments were arranged as follows:

(1) To maintain high temperature and high humidity a large drying oven was arranged with four shelves above two electric heaters. Between the heaters and the shelves were buckets of water with sacks and towels hanging into them to increase the evaporating surface.

(2) For high temperature and low humidity a Freas electric oven was used with sufficient ventilation to maintain a comparatively low relative humidity, but sufficient heat to maintain a comparatively high temperature.

(3) Two lockers were maintained at room temperature, one with the ordinary humidity of the room and the other with provision for maintaining a high relative humidity.

(4) The cold storage room, where a check lot of pears was kept, was maintained constant by means of a thermostat so that the temperature was always between 30.5° F. and 32.8° F. with the relative humidity ranging between 67% and 73%.

Throughout the experiment, which continued for 21 days, one hygrothermograph was kept on the third shelf (next to the bottom shelf) in the large drying oven and another in the locker with normal temperature and high humidity. These were both checked several times by wet and dry bulb psychrometer and tested mercurial thermometers.

Eight five-pound grape baskets were filled with Bartlett pears and placed on September 2 at noon, in the various previously described situations. Each lot was numbered and described as follows:

Lot 1. Top shelf (No. 1) of large oven. High temperature, 85° F. and high humidity, 100%.

Lot 2. Next to top shelf (No. 2) of large oven. High temperature, 88° F. and high humidity, 100%.

Lot 3. Next to bottom shelf (No. 3) of large oven. High temperature, 94° F. and high humidity, 91%.

Lot 4. Bottom shelf (No. 4) of large oven. High temperature, 104° F. and rather low humidity at about 60%.
Lot 5. In small Freas electric oven. High temperature, 95° F. and low humidity, well below 50%.
Lot 6. Ordinary locker in concrete building. Room temperature, 71° F. and room humidity about 60%.
Lot 7. Ordinary locker in concrete building. Room temperature, 69° F. and high humidity, 92%.
Lot 8. Held in cold storage at between 30.5° and 32.8° F. and a humidity ranging from 67% to 73%.

OBSERVATIONS ON TEMPERATURE AND HUMIDITY.

In addition to the continuous hygrothermograph records made by Lots 3 and 7, the writers made careful check readings on thermometers at intervals of from one to four days apart. For reference, these are tabulated in Table I.

TABLE I—*Temperature records during storage tests.*

1918—Date	Time	Temperature of lots in degrees Fahrenheit.							
		1	2	3	4	5	6	7	8[2]
September 2	11:10 A.M.	85.5	89.5	94.	108.				31.3
September 3	3:00 P.M.	84.	89.	92.	104.	86.	70.7	70.	31.0
September 6	9:45 A.M.	83.2	89.	95.2	107.6	87.	69.2	68.	32.8
September 7	9:00 A.M.	84.5	90.	95.7	107.			68.5	31.4
September 9	12:15 P.M.	88.5	90.	98.	112.1		69.2	67.5	30.5
September 10	3:45 P.M.	84.5	90.	95.7	107.6	96.8	70.	68.	32.7
September 14	12:00 Noon	84.	87.	92.2	100.8	97.7	72.7	70.2	31.4
September 16	12:15 P.M.		85.5	93.	102.2	96.8	71.	69.	31.7
September 19	1:45 P.M.		86.	93.2	103.1	93.6	72.	69.5	32.4
September 20	11:45 A.M.			84.	86.5	94.1			32.8
September 20	5:40 P.M.[1]			77.	77.				
September 21	11:45 A.M.			92.	96.1	101.3			30.8
September 23	9:45 A.M.			100.5	107.2	103.1			30.7
Average		84.9	87.7	93.9	103.7	95.	70.7	68.9	31.7
Maximum		88.5	90.	100.5	112.1	103.1	72.7	70.2	32.8
Minimum		83.2	85.5	77.	77.	86.	69.2	67.5	30.5

[1]Electric current off from 11:45 A.M. to 5:40 P.M. only.
[2]Temperature with Lot 8 in cold storage remained quite uniform, rising to the maximum and dropping to the minimum with each run of the compressor about every three hours.

All of the above records were made immediately on first opening the doors to the ovens or other compartments, two observers working together. During the time observations were being made on the fruit the temperatures as well as humidity dropped but the hygrothermograph charts show that under the high temperatures prevailing in the large oven, normal conditions were restored in from 30 minutes to 2 hours as regards temperature, and in from one to two hours as regards humidity. In the locker with Lot 7 with air temperature normal, high humidity was restored in from 4 to 10 hours after closing the door. In no case, however, did the humidity

drop below 90 per cent and remain there for more than one hour. The slow rise from 95 per cent to 100 per cent or saturation required the longest time.

The observations on humidity are tabulated below in Table II and notes immediately following.

TABLE II—*Humidity records during storage tests.*

1918—Date	Time	Relative humidity of lots in per cent				
		1	2	3	7	8[1]
September 2	11:10 A.M.	100.	100.	92.	-------	69.
September 3	3:00 P.M.	100.	100.	-------	82.	68.
September 6	9:45 A.M.	100.	100.	89.	84.	73.
September 7	9:00 A.M.	100.	100.	88.	92.	69.
September 9	12:15 P.M.	100.	100.	82.5	96.	67.
September 10	3:45 P.M.	100.	100.	83.	91.	73.
September 14	12:00 Noon	100.	100.	94.	96.	69.
September 16	12:15 P.M.	-------	100.	93.	98.	70.
September 19	1:45 P.M.	-------	100.	89.	97.	72.
September 20	11:45 A.M.	-------	-------	100.	-------	73.
September 21	11:45 A.M.	-------	-------	98.	-------	68.
September 23	9:45 A.M.	-------	-------	93.	-------	68.
Average	----------	100.	100.	90.7	91.7	70.
Maximum	----------	100.	100.	100.	98.	73.
Minimum	----------	100.	100.	82.5	82.	67.

[1]Humidity with Lot 8 in cold storage remained quite uniform, rising to the maximum and dropping to the minimum with each run of the compressor about every three hours.
Lot 4 ranged about 60% humidity.
Lot 5 ranged well below 50% humidity.
Lot 6 ranged from 53 to 65% humidity.

Lots 1 and 2 are indicated as having been always in a saturated atmosphere. This was assumed from the fact that every time the door was opened to take readings the walls, top and bottom of shelves were covered with drops of precipitated moisture and the wrapping paper surrounding the fruits was always moist. This was not generally true with Lots 3 and 4.

The condition of the fruit itself as indicated by its wilting should serve as a good indication of the relative humidity of the atmosphere surrounding the various lots. This will appear later.

BEHAVIOR OF FRUIT.

At the start all the pears were very much the same in degree of ripeness, all being yellowish-green and described as being about one-fourth ripe, as indicated by color. Degree of ripeness may be described from two standpoints, namely: appearance, indicated largely by color, and condition, indicated by texture, juiciness and flavor. It was possible to describe the former as a certain fraction ripe, and the fractions in Table III refer to ripeness in appearance only, unless otherwise noted. Additional notes are given to cover condition. The pears in each lot were examined at approximately four-day intervals and careful notes made, as to appearance and condition. The somewhat abridged notes in Table III indicate adequately the condition of the fruit as the experiment progressed.

TABLE III—*Condition of pears during the progress of the storage test.*

Lot No.	Treatment	Date of examination				
		Sept. 6	Sept. 10	Sept. 14	Sept. 19	Sept. 23
1	High temperature, 85° F. High humidity, 100%.	Three-fourths ripe. Greenish yellow to yellow. All in good condition; plump.	Full ripe. Clear yellow. Medium firm ripe condition. A few small breakdown spots on surface.	Past ripe. Soft. Considerable breakdown and decay developing.[1]		
2	High temperature, 88° F. High humidity, 100%.	Two-thirds ripe. Greenish yellow. All in good condition. Plump.	Four-fifths ripe. All O. K. Plump. Firm, unripe.	Nine-tenths ripe. Full yellow. Firm ripe. A few fruits show small decay spots.	60 per cent breakdown and mould. Rotten.[1]	
3	High temperature, 94° F. High humidity, 91%.	One-half ripe. Yellowish green to greenish yellow. All in good condition. Plump.	Two-thirds ripe. Greenish yellow. Hard unripe. Faint trace of wilting.	Three-fourths ripe in color and texture. Some fruits plump, others very slightly wilted.	Nine-tenths ripe in appearance. Nearly to full yellow. Four-fifths ripe in texture. Hard or very firm ripe. Slightly wilted.	Fully colored yellow. Firm, unripe, wilted.
4	High temperature, 104° F. Moderate humidity, estimated at about 60%.	One-third ripe. Yellowish green. One pear rotten, others O. K. Plump.	One-half ripe. Yellowish green to greenish yellow. Perceptibly wilted. One with complete breakdown in lower third of length.	One-half ripe. Practically the same as Sept. 10.	Two-thirds ripe. Greenish yellow. Two-thirds ripe in texture.	Three-fourths to four-fifths colored yellow. Hard, unripe. Rather badly shrivelled. Dry.

5	High temperature, 95° F. Low humidity, well below 50%.	Five-sixths ripe. Yellow. Wilting slightly.	Temperature too high; fruit cooked. New lot from storage to replace old.	One-half ripe, almost. Nearly as ripe as Lot No. 4.	Two-thirds ripe. Same as Lot No. 4.	Three-fourths to four-fifths colored yellow. Same as Lot. No. 4 in every way.
6	Room temperature, 71° F. Room humidity, 60%.	Nine-tenths ripe. Nearly full yellow. Firm, ripe. Plump.	Almost as ripe as Lot No. 1.	Full ripe to past ripe, or medium to soft ripe. Undisturbed fruits in best condition.	Dead ripe to past. All fruits show more or less breakdown.[1]	
7	Room temperature, 69° F. High humidity, 92%.	Five-sixths ripe. Yellow. Plump. Good condition.	Practically as ripe as Lot No. 1.	Full ripe to slightly past. No noticeable difference as compared with Lot No. 6.	Same as Lot No. 6.[1]	
8	Cold storage, 32° F. Moderate humidity, 70%.	One-fourth ripe or less.	Remained practically the same throughout the period of the experiment.			

[1]Removed from the experiment.

The experiment was continued beyond September 23, but on the 25th an accident in the regulation caused the temperatures to climb abnormally high in the box where Nos. 1 to 4 were located. The result was that the pears in Lots 3 and 4 were both cooked brown so that further observations were impossible. It was interesting to note, however, that Lot 3 was cooked much more severely than Lot 4.

Just before this one fruit each from Lots 3 and 4 were placed where Lot 7 had been at room temperature and high humidity, the object being to find out whether these fruits would ripen normally after removal from the high temperature. These fruits were observed and sampled on September 28. No. 3, although noticeably wilted on September 23, had, by the 28th, become apparently more plump, appearing almost normal. Fruit was full soft ripe. Flesh was rather tough. Flavor was more acid than normal with a faint trace of bitterness, though this may have been due to the absorption of the odor from the cedar wood closets in which the fruit was held. At any rate, the ripe fruit was much poorer in quality than the Bartlett at its best when ripened at normal temperatures. No. 4 was still as wilted as before. Fruit was full ripe, but dry and tough. This fruit remained about as wilted as when put in. This fruit was not soft, but as much so as it ever would be without being well past ripe. Very inferior in flavor and quality—much the same as No. 3.

Lot 8, which was held in cold storage throughout the progress of the experiment, showed almost no appreciable ripening, being practically as hard and unripe at the end of the month as at the beginning.

DISCUSSION OF RESULTS.

The pears in Lot 1, placed at a temperature averaging about 85° F. and in a saturated humidity, were full ripe eight days after being subjected to the above conditions.

A study of the table shows that the pears in Lot 2, placed at a temperature averaging 87.7° F. and in a saturated atmosphere, were full ripe about thirteen days after being subjected to the conditions just referred to. Since the fruit was all in the same stage of maturity before the experiment started, this would show a delay of five days in ripening which can only be accounted for by the fact that the temperature was about ten degrees higher.

The pears in Lots 6 and 7 were full ripe also eight days after the experiment started. The temperature surrounding Lots 6 and 7 was practically the same in both cases and averaged about 70° F. The difference in the conditions surrounding these two lots was in the humidity. The humidity in the compartment containing Lot 6 was fairly constant about 60%; the humidity surrounding Lot 7 averaged about 92%. The temperatures alike, the difference in humidity showed no effect upon the ripening. Furthermore, when compared to Lot 1, the fruit ripened with approximately the same rapidity at temperatures of 70° F. and 85° F.

The pears in Lot 3 remained firm unripe for three weeks after being subjected to a temperature averaging about 94° F. and a humidity of 91%. This shows a delay of thirteen days when compared to Lots 1, 6 and 7. This was perhaps due to the somewhat greater temperature at which the pears were kept. The somewhat lower humidity resulted in the pears wilting appreciably.

The pears in Lot 4 were hard, unripe, or not quite as ripe as the fruit in Lot 3. The temperature averaged about 104° F. and the humidity approximately 60%. The higher temperature resulted in an appreciable delay in ripening when contrasted to Lot 3, but the lower relative humidity caused considerable wilting. With the high temperatures some difficulty was experienced in maintaining as high humidity as was desired in the case of Lots 3 and 4.

INTERPRETATION OF RESULTS.

It is somewhat difficult to account for the surprising results obtained. The general idea has been that low temperatures only were of importance in preserving fruits for any period of time and in arresting the deteriorating processes. As contrasted

to this, high temperatures were looked upon as extremely conducive to a hastening of the breakdown of the tissues and in shortening the keeping period of fruit.

The explanation might lie in the fact that with low temperatures, conditions are brought about whereby not only katabolic activity or destructive metabolism, but all metabolism, is lessened or reduced to a minimum.

On the other hand, it has seemed probable to the writers that the high temperatures and high relative humidity surrounding the fruit may have brought about conditions whereby the tissues were able, at least partially, to carry on anabolic activity or constructive metabolism and hence lessen indirectly the amount or rapidity of activity which would bring about deterioration.

As has been stated elsewhere, the experiments reported upon are of a very preliminary nature and an effort is being made to repeat them. Furthermore, at such high temperatures for any long period of time the flavor might be affected so that the quality would be appreciably lowered.

As a matter of fact, the flavor of the pears subjected to the higher temperature was somewhat abnormal. A slight acidity was noticeable and a lacking of the normal somewhat sweet taste was apparent when the pears subjected to the high temperature were tasted. This can probably be accounted for by the fact that the comparatively high temperatures would be expected to increase the respiration. Carbohydrates are necessary for respiration and are gradually used by this process, hence it follows that the sugar content would have been decreased. This decreasing of the sugar content would have made the normal acid content somewhat more noticeable, and, in addition, it is possible that intra-molecular respiration may have been carried on to a certain extent and this gave rise to waste products that affected the flavor.

A second drawback to the practicalness of utilizing high temperatures and high humidity in keeping fruits is the danger from rot. Under such an environment, conditions are very favorable for the growth of fungi or bacterial organisms which would bring about the decay of the fruit.

Therefore, while the experiments show that temperatures ranging from 95° F. to 110° F. with the optimum at about 104° or 105° F. will delay or prolong the normal ripening process of Bartlett pears at least two weeks when contrasted to fruit placed at average room temperatures of 70° to 80° F., the danger from rot and the development of abnormal flavors limit the practical use of these higher temperatures.

PRACTICAL APPLICATIONS.

As just discussed the practical application of the data presented is perhaps somewhat limited, but it may be of value in some years and in certain sections in connection with the time of picking pears. For example, as a rule during the hottest seasons the growers have felt that the necessity for earlier picking is greater than when the season is normal at time of ripening. In view of the results obtained it might really happen that the ripening of the pears was delayed by the excessively hot weather, and would mean that the fruit might well be allowed to remain on the trees longer than would be the case in a normal season. This would be of especial value where fruit was being harvested and packed for Eastern shipment. Pears are a fruit which are picked comparatively early in order to have it reach distant markets and hold up well. And while they should preferably be not allowed to ripen on the tree to avoid the marked development of the grit cells, it might mean that on the excessively hot years, contrary to expectations, the fruit could be left safely on the trees somewhat longer and thereby a better flavor and quality developed.

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(2) Overholser, E. L.—Color development and maturity of a few fruits as affected by light exclusion. Proc. Amer. Soc. Horti. Sci. (1917), pp. 73–85.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF JANUARY, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	73
Passengers arriving from fruit fly ports	1,372

Horticultural imports:

	Parcels
Passed as free from pests	78,646
Fumigated	934
Refused admittance	19
Contraband destroyed	32
Total parcels horticultural imports for the month	79,631

PESTS INTERCEPTED.

From Central America:

Pseudococcus spp., and *Aspidiotus cyanophylli* on bananas.

From China:

Cylas formicarius in sweet potatoes.
Lepidopterous larvæ (undetermined) in shelled peanuts.

From England:

Lepidopterous borer (undetermined) in red currants.

From Hawaii:

Diaspis bromeliae and *Pseudococcus bromeliae* on pineapples.
Hemichionaspis minor and *Chrysomphalus aonidum* on green cocoanuts.
Coccus longulus on betel leaves.
Pseudococcus spp. on cocoanuts.

From Mexico:

Lepidopterous larvæ (undetermined) in dry roots.
Leconium spp. on cocoanut palms.
Chloridea obsoleta in tomatoes.
Fungus (undetermined) on oranges.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	18
Fish boats inspected	14
Passengers arriving from fruit fly ports	0

Horticultural imports:

	Parcels.
Passed as free from pests	117,777
Fumigated	17
Refused admittance	12
Contraband destroyed	5
Total parcels horticultural imports for the month	117,811

PESTS INTERCEPTED.

From Arizona:

Unidentified Lepidopterous larvæ in garlic.

From Central America:

Aspidiotus cydoniae on bananas.

From Florida:

Phomopsis citri, Lepidosaphes beckii and *Parlatoria pergandii* on oranges and grapefruit.
Pseudococcus spp. on eggplant.

From Idaho:

Rhizoctonia on potatoes.

From Mexico:

Chloridea obsoleta in tomatoes.

From Oregon:

Laspeyresia (Carpocapsa) pomonella in apples.
Rhizoctonia on potatoes.

From Texas:

Cylas formicarius in sweet potatoes.

From Washington:

Leptothyrium pomi and *Venturia inaequalis* on apples.
Rhizoctonia on potatoes.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	18
Fish boats inspected	40
Passengers arriving from fruit fly ports	25

Horticultural imports:	Parcels
Passed as free from pests	8,892
Fumigated	0
Refused admittance	0
Contraband destroyed	5
Total parcels horticultural imports for the month	8,897

PESTS INTERCEPTED.

From Arizona:

Rhizoctonia on potatoes.

From Central America:

Aspidiotus cyanophylli on bananas.

From Mexico:

Lepidosaphes beckii on oranges.

From Oregon:

Rhizoctonia on potatoes.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	6
Passengers arriving from fruit fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	2

RIVERSIDE COUNTY STATION.

Horticultural Imports:	Parcels
Passed as free from pests	13
Fumigated	1
Total parcels horticultural imports for the month	14

PESTS INTERCEPTED.

From Pennsylvania:

Rhizoctonia on potatoes.

LOS ANGELES COUNTY STATION.

Horticultural Imports:	Parcels
Passed as free from pests	69
Fumigated	9
Refused admittance	1
Total parcels horticultural imports for the month	79

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VOLUME VIII No. 4

MONTHLY BULLETIN

OF THE

STATE COMMISSION OF HORTICULTURE

STATE CAPITOL, SACRAMENTO.

SACRAMENTO, CALIFORNIA APRIL, 1919

CONTENTS.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Volume VIII APRIL, 1919 No. 4

California Crop Distribution and Estimates 1918

A Bulletin Dealing With the Acreage, Distribution, Tonnage and Valuation of Commercial Fruit and Vegetable Crops, in California

SPECIAL NUMBER PREPARED BY THE
STATE COMMISSIONER OF HORTICULTURE
In Co-operation with the Bureau of Crop Estimates,
U. S. Department of Agriculture

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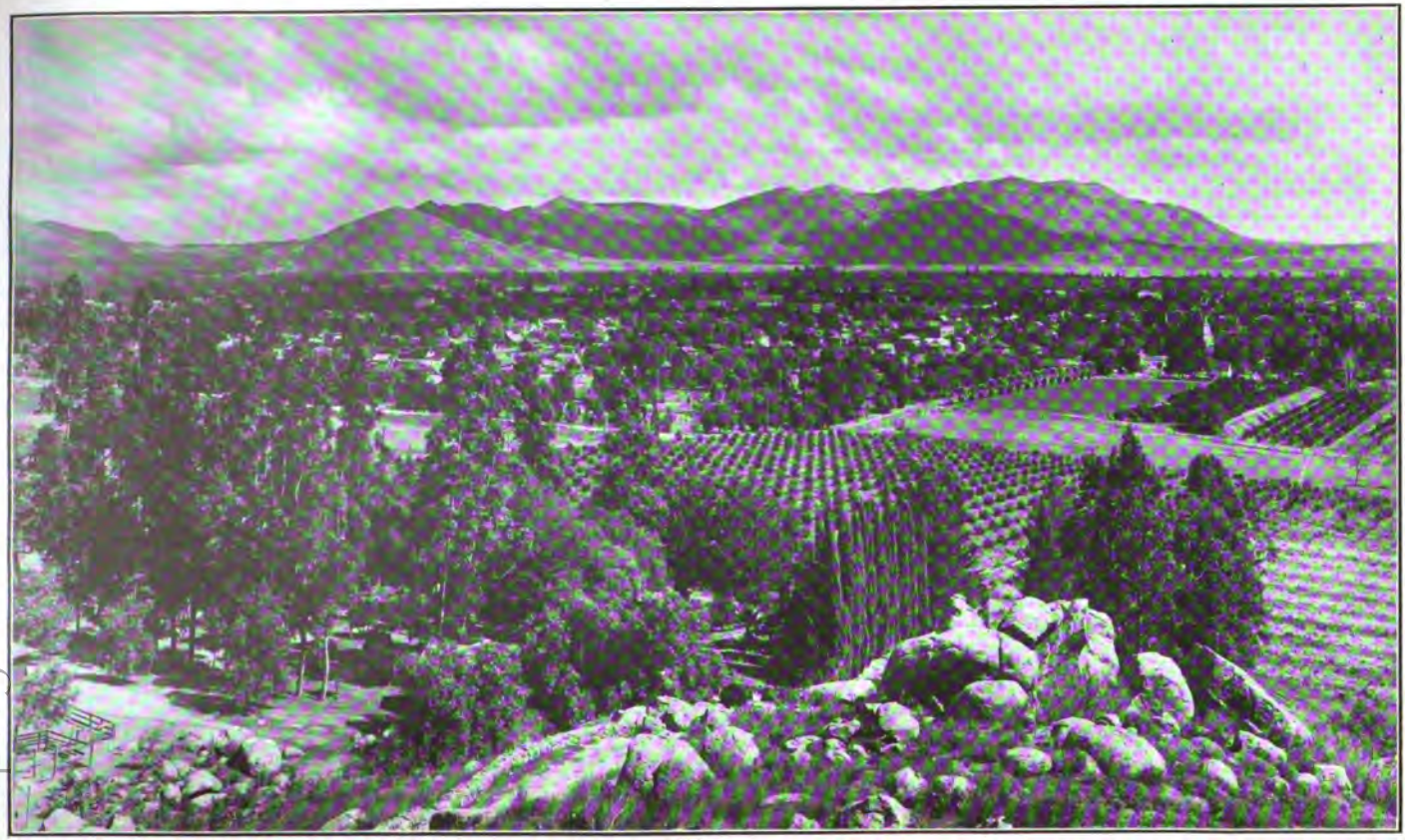

FIG. 61—IN THE HEART OF THE SOUTHERN CALIFORNIA CITRUS DISTRICT.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

Acceptance for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917; authorized August 27, 1918.

Vol. VIII. April, 1919. No. 4

"CALIFORNIA'S GREATNESS MAY BE MEASURED IN TERMS OF HORTICULTURE AND AGRICULTURE—THEREFORE LET NO SINGLE PHASE OF THESE, HER CARDINAL FACTORS, BE NEGLECTED."

THE TRUE VALUE OF HORTICULTURAL STATISTICS.

Proverbially, statistics are dry! And the public speaker or the writer who is statistically inclined usually is not very popular. With this fact in mind, the attempt has been made in this special statistical number of the "Monthly Bulletin" to overcome the tendency to dry tabulated and purely statistical matter by incorporating more or less striking pictures and short articles setting forth facts in addition to those conveyed by the figures and emphasizing some of those things that are statistically important.

The State Commission of Horticulture long has recognized the vital need of a publication of this character; one which would give figures that were carefully compiled and which, when printed, could be taken as authentic. The demand for such information is very great! Prospective purchasers of orchard or farm lands invariably ask questions regarding acreage and production, many of which we have had no accurate way to answer. The man who is locating in California for the purpose of growing a certain fruit wants to know which counties are best adapted for the production of that particular fruit and the present bearing acreage in each county. He also wants to know the average production of trees at different ages and the prices that he may

expect to receive for his fruit. Certainly any one who wishes to become a citizen of our state is entitled to this information which may contribute so largely toward the success of his venture.

The fruit dealer wants the same kind of information, which in the past he has not been able to secure with any degree of certainty. Prices may be wrongly fixed because of misinformation on the probable production, to the detriment of the fruit growers.

The transportation companies also greatly desire accurate information on the probable production during any season. The first thing to be done in order that such information may be supplied is the compilation of accurate figures on acreage of every fruit in every county of the state where any variety or kind is grown. With accurate acreage figures as a basis for estimate, and a knowledge of the normal production of different fruits per acre, it is possible, when the condition of a crop at any time during the season is known, to estimate quite accurately the total production for the season. It has therefore been attempted to secure reliable figures on acreage from the county horticultural commissioners, and each year for the past six years our efforts have been increased until at the present time it may be said without fear of contradiction that almost exact figures have been secured in some cases, although in others, they are still more or less of an estimated nature. The county horticultural commissioner, who is duty bound to make reports to the State Commissioner of Horticulture, has the best possible chance to secure these figures. It is not expected that he depend entirely upon his own machinery in doing this work and, if, for example, such organizations as the larger fruit exchanges have carefully gathered figures on acreage, the county horticultural commissioner should depend on them as his source of information. In most cases, however, an orchard survey offers the only solution to the problem. In certain counties the commissioners have conducted these surveys in a thoroughly systematic and effective way, whereas, in others, a beginning only has been made, and the available sources of information, viz, county assessors, fruit growers' organizations, census, etc., are depended upon almost entirely.

For the past two years this office has been co-operating closely with the Bureau of Crop Estimates, United States Department of Agriculture. This co-operation has resulted in an additional check on the figures which we have been able to secure from the county horticultural commissioners. Through the courtesy of the Hon. J. E. Rickards, Mr. E. E. Kaufman and Mr. R. G. Risser, who represent the Bureau of Crop Estimates in California, we have received able assistance in gathering the data presented in this number, and, while no claims are made that all the figures are correct, we do believe that never before has such an accurate and comprehensive work of this nature been published. The aforementioned gentlemen have exerted every effort toward verifying figures that have been submitted to them from this office, and in addition, have made extensive compilations without the aid of this office. In the case of figures on wheat, oats, barley, rice and potatoes, Mr. Rickards succeeded, after overcoming many difficulties, in compiling figures that are as accurate as it is possible to secure in the absence of any effective county or state system of aid. They are published with a full knowledge that they can not be exact,

yet in a comparative sense, they are exceedingly valuable and fairly accurate in giving to the reader a knowledge of these crops in the various counties where they are grown.

With these few comments we offer this special statistical bulletin to our readers with the hope that it may be found interesting and valuable and, with confidence that it will, in addition, serve the very valuable purpose—a basis for future statistics of a like nature.—G. H. H.

THE "COUNTY BASIS" IN FORECASTING ESTIMATES.

In the preparation of the tables which show the acreage by counties of cereal crops and potatoes, we were obliged to adopt new and untried methods. There has not been heretofore any attempt made to establish a county basis for our calculations in forecasting total county production of these crops. The bureau's practice has been to accept the *total acreage* of the state as reported by the Bureau of the Census every ten years. The year following the census, our crop reporters would estimate the acreage planted as a percentage of the acreage reported by the census for the preceding year; the years following, the reports would be on a percentage of the preceding year, and so on until the next census figures were available. We are now making an attempt to get down to a county basis.

In the absence of any associations of the growers of these crops, such as are found among fruit and nut growers, there were no records to be consulted and we were driven to fix, rather arbitrarily, the figures as given in several counties. This entailed upon us much labor and correspondence. The result is found in the tables.

Though we do not lay claim to the absolute accuracy of these tables, we believe they are as nearly accurate as is possible to get them; nothing short of a survey of the individual farms (which is impossible) would give any better results. The tables have been accepted by our bureau and will form a basis for our future forecasts and estimates until the next census is taken. It is our expectation and purpose to hereafter follow the county plan, rather than—as heretofore—reporting on the state as a whole.—J. E. RICKARDS.

SPECIALIZING IN FRUIT GROWING IN CALIFORNIA.

Because of the great diversity in climatic conditions which exists throughout the various states of the Union and because of the fact that extreme cold makes the growing of certain if not all fruits impossible, fruit growing resolves itself into a rather narrow specialty, both from the standpoint of individuals actually engaged in the business in a commercial way and the area of land utilized in growing fruit trees. Because of great land areas where freezing temperatures are seldom experienced as a result of the influence of ocean currents, California is able to produce in abundance a number of tender, semi-tropical or tropical fruits that can not be grown, except in a very few cases, in other states of the Union.

In the case of almonds and olives, California produces practically the entire commercial output of the nation. Florida is a sharp competitor in the case of citrus fruits, especially oranges and grapefruit. The navel orange is, however, a California specialty and the two original trees that were imported from Bahia, Brazil, and from which all of the navels grown in the United States originated, may be seen growing and bearing today at Riverside, where they were planted about 1875.

The California grape industry is in a class by itself. The vinifera varieties for table use are grown on a large scale, and the raisin industry has assumed a position of very great importance.

The English walnut is in its prime in California and practically the entire production of the United States is in a few southern California counties.

In addition to all the common deciduous fruits which are grown over wide areas in California, there are a number of delicate, more or less, tropical fruits that are now being grown successfully; for example: Avocado, feijoa, loquat, and mango.

Specializing in the different localities is religiously practiced. In the Santa Clara Valley, surrounding San Jose, for example, we find prune and apricot drying to be the principal fruit specialty; in the Pajaro Valley with Watsonville as its center more than 50 per cent of the apples of the state are grown, and 85 per cent of these are of two varieties, Yellow Newtown Pippin and Yellow Bellefleur; in Sutter County the Phillips cling peach is the favorite and the entire output is sold to the canneries; in the Newcastle section of Placer County shipping peaches, plums and pears are the specialty and little or no fruit is dried in this section; in Lake County the Bartlett pear does exceptionally well and almost the entire output is dried; in Sacramento County the same pear is grown but all are either packed and shipped fresh or sold to the canner; in the San Joaquin Valley practically all the peaches are either dried or canned and none are shipped in the fresh state; date growing is confined to a relatively small section in Imperial and Riverside counties, and citrus fruits are grown in abundance in San Bernardino, Riverside, Orange, Los Angeles, Ventura and Tulare counties. These few illustrations are given for the purpose of emphasizing California's success in specializing within the fruit business, for the keynote to successful fruit culture may be found in the one word "specialize."

SPECIALIZING WITHIN THE FRUIT BUSINESS.

All of the older fruit sections of the various states have passed through a period of experimentation to determine, first, if certain fruits would do well, and second, the varieties that were adapted to the varying conditions of soil and climate. As a result of this experimental process, it is now known quite definitely in each locality which varieties are suitable and which may be expected to fail. Another result may be seen in the older orchards of a dozen or more varieties blooming and ripening at different seasons, often requiring different treatment in the way of spraying, etc., and from a commercial standpoint, the word "failure" best expresses their value. From the standpoint of home orchards they may be considered successful. A sharp

distinction should thus be made between the home orchard and the commercial orchard. The former may be planted with the idea of supplying the family with a great variety of fine fruits throughout a long season, but the latter must be planted with the idea of the greatest economy in the growing, handling and disposition of the fruit. In the Gravenstein apple industry near Sebastopol in Sonoma County, many years ago it was discovered that this particular variety was well adapted to the conditions existing in that section. It was also discovered that there was a ready sale for this apple because it ripened at a time when apples of all kinds were very scarce. Therefore instead of planting a half dozen or more miscellaneous varieties the growers of Sebastopol specialized on the Gravenstein and a very large part of the acreage of that locality is producing this splendid apple, and the growers are doing remarkably well.

On account of the value of cross-pollination, the planting of only one variety of apple, plum, pear, peach, cherry or other fruit in an orchard is not advised, but it is strongly recommended that not more than three varieties constitute the commercial orchard planted today.

GROW THE BEST OF YOUR SPECIALTY.

Having chosen varieties that are well adapted, the next important step for the commercial fruit grower is to produce fruit of such a character that it will find a ready sale in the markets. Not every grower can do this, for fruit growing, like every other business, requires not only a thorough knowledge of the various details, but in addition a love for the work which can only be appreciated by those who have become familiar with tree life, who recognize in the tree a living thing which responds to good treatment and which refuses to do its best in the face of bad treatment. The lover of plants is the man who can grow plants because he takes the time to study them in order that their needs may be determined and supplied. There is many a man in the orchard business who would make a better success raising chickens or cattle, for his likes run in that direction and not toward orcharding.

The best apples, the best pears or the best peaches are always in demand and the man who can grow them has overcome the first and greatest difficulty in securing a market. During seasons of low prices, which are usually due to large crops, the poorer grades of fruits may not pay for the picking. This is seldom true of the finer grades, and success will come to the orchardist who will study his orchard's needs, and who will give it the proper attention in the way of pruning, cultivating, fertilizing, and spraying.

AN ATTRACTIVE AND HONEST PACK PAYS.

The best of fruit may not be packed in such a way as to command the highest price. Attention to the package and the packing is now known to play a very important part in the disposition of fruit at favorable prices. The public appetite for fruit depends not only upon the way it tastes but also the way it looks. If this were not so, why does a red Gano apple with little quality sell as well as a white Winter Pearmain with most excellent quality when the two are placed together on the fruit stand? Just as attractiveness, due to color in the apple,

makes it sell, so attractiveness in the pack is an aid in selling for good prices. This principle has become so well recognized in the Western States where apples are packed in boxes that in most cases the fruit is placed in regular, compact layers throughout the package, each fruit being first wrapped neatly in a piece of tissue paper, and even the so-called jumble pack is faced two layers deep to cover up its unattractiveness. Possibly there has been a tendency to go to the extreme in pleasing the public eye, and possibly we have not done enough to aid in the selection of first-class fruit and the best varieties. Perhaps in our eagerness to please by preparing attractive packs too much money has been expended, and profits have been dependent upon a limited, very high class trade. In the recent popularity of the lug box in California which is being used for shipping grapes, plums, apricots and peaches, and occasionally other fruits, without packing, there would seem to be a tendency toward eliminating the heavy packing expense, with the idea that the net returns will be fully as great if not greater. Despite this tendency, there can be no denying of the fact that the fruit business has benefited in the past from the various kinds of attractive packs.

Of much greater importance than the attractiveness of the pack is the character of fruit in the package. Uniformity in maturity, size and quality is desirable. Deceptive packing no longer should be tolerated. In California we have two laws designed to prevent deception and their operation for the past two years has meant thousands of dollars to the industry. The tendency now is toward Federal legislation which will unify the work of standardization in the different states of the Union. We have made such good progress in this work in California that we are not in favor of Federal control at this time, believing that it would be impossible to accomplish as much for some time at least under Federal laws as we are now accomplishing under our state laws. Perhaps the work can in some way be so co-ordinated that the good points of our state system may be retained and, if the passage of a Federal law would benefit all other states of the Union, it certainly would be welcomed by the industries affected in those states.

ADVERTISING.

In the fruit business as well as in other lines of business, it has been discovered that advertising pays. There is therefore much systematic advertising today carried on in various ways. The individual grower has adopted certain names for his special grades and in this way his fruit becomes known to the trade. The various fruit growers' organizations have done likewise and in some cases have been able to go much further. For example, the Associated Raisin Growers, an organization in California which largely controls the raisin output, has carried out an extensive and expensive campaign of advertising and the picture of the raisin loaf is commonly seen in the Saturday Evening Post as well as many others of the high class magazines and papers of the country. This systematic campaign of advertising which they have conducted has resulted in a tremendous increase in the sale of raisins, and is one of the things which in recent years has put the industry on its feet.

Another example of systematic, widespread advertising may be found in the Northwestern Fruit Growers' Exchange which packs the "Skookum" brand of apples and advertises same in leading magazines of the country. It is safe to say that the results of this campaign will more than justify the expenditure of every cent of money that has been necessary to carry on the campaign.

The California Fruit Growers' Exchange have as their special pack a grade of oranges called "Sunkist." The Sunkist sign is well known to practically every consumer of oranges in the country. I dare say that if we were to ask the manager of the exchange, which is one of the greatest organizations of its kind in existence, to name the thing that has helped them most in establishing a reputation for the fruit they pack, he would at once say the very extensive advertising of their splendid "Sunkist" brand.

ORGANIZATION.

The most effective advertising can be done only through organizations, for the average individual has neither the fruit nor the ability to enable him to attract public notice of his product. More and more is the value of fruit growers' organizations being recognized, and it may be said that in many cases they have been the salvation of the fruit business. Here and there may be found the exceptional individual who possesses the qualifications of a good orchardist and good salesman, and who does not need to lean on an organization for support. Such men are the exception and not the rule, and the average orchardist must have the help of a marketing organization for the best results in his business. It is often said that farmers are the hardest people on earth to induce to pull together, yet they are doing it more and more as the years go by.

PRODUCTION.

Thus far the problems that have been touched upon bear a close relation to the marketing or disposition of the fruit crops. This phase has purposely been treated first because after all it matters not how much fruit we can grow, it is of little value, unless the marketing problems can be solved, and they are therefore of every importance.

A few other problems which have more to do with the production end of the business are worthy of consideration. The experimental work in growing orchards already has been mentioned and the fact needs emphasis that many of the early and some of the later plantings do not pay interest on the land which they occupy. There is a weeding-out process going on which eventually will eliminate the unproductive and unprofitable orchards. Some of these have been planted on land unsuited to orchard culture, others because of undesirable varieties or conditions which prevent production are not profitable. In California this is true and there are thousands of acres planted to certain fruits that are much better adapted to alfalfa and hogs. Not only is it a fact that there are many orchards which should be taken out entirely, but it is also true that there are individuals in every orchard which do not pay for their keep, just as there are cows in some dairy herds that do not pay for their keep. Individual tree records are now being

kept by some fruit growers, especially orange and lemon growers, and the average production throughout a series of years is in this way determined. Trees that are found to be unprofitable are rooted out and replanted or top-worked over from buds taken from profitable individuals. Thus the tendency to grow more fruit and fewer trees is rapidly increasing. The time will come when the nurseryman will be compelled to select his buds and scions for propagating purposes from trees that are known to possess desirable characters with respect to production, and the now too common practice of taking buds from the prunings of young orchards which have never borne and about which nothing is known in a productive sense, will of necessity be abandoned. In the selection of disease or insect resistant buds from individual trees or from certain species for propagating purposes, there is a tremendous field for profitable experimentation and already we can point to some striking examples of insect and disease control brought about by discoveries of nonsusceptibility to the attack of certain insect pests or diseases. For example, grapevines are grown on phylloxera resistant roots; pears are now being grown on blight resistant roots, and apples of the Northern Spy variety are not attacked by woolly aphis.

In conclusion, the future of fruit growing in California, where certain fruits find conditions congenial, is bright. In general it is not a good thing to carry all of one's eggs in the same basket and there has been too much of a tendency in the past to misrepresent to the prospective grower the profits which he could expect to make from an orchard. The desire of real estate agents to sell land, and the unsound judgment of commercial organizations have been responsible for this in a large degree. Values of fruit land have become inflated because of phenominal returns during a certain season, and many men have lost the accumulated earnings of years by placing their confidence in those who have based land values on the production of a single good year rather than upon the average of a series of years which is the only true basis of valuation. With the experience of the past to guide the fruit grower of the present and future; with the ever-increasing scientific information that is available as an aid to production, and with the adoption of those principles of honesty and integrity which make for success in other lines of business, the fruit industry of the future in California should prosper.—G. P. W.

CALIFORNIA CROP PRODUCTION BY COUNTIES.

Agriculture is the greatest industry in California; the value of all crops grown within the state in each of the last two years being more than $400,000,000. As the industry has been more recently organized and competition in marketing the products of the farm has become more keen, there has grown up an insistent demand for more reliable data concerning the production of our various crops, and with the entry of the United States into the World War definite information of acreage and production, and the possibility of increasing production, was demanded not only by states but for the various counties and subdivisions of the state. To meet this demand, as well as to answer

numerous inquiries concerning agricultural production in the various counties of the state, the following estimates on crop production in 1918 have been prepared.

In 1914 the State Commission of Horticulture published the first figures on the bearing acreage of the various fruit crops throughout the different counties of the state. As a wider knowledge of the plantings of the various fruit crops was obtained, these figures have been revised from year to year and at the present time are probably the most reliable that can be secured concerning acreage estimates; consequently for the various fruit crops the figures of the County Horticultural Commissioners on acreage for 1918 were made the basis of this report. In some instances it was found necessary to modify them to a slight extent to conform with other—and seemingly more reliable—data that was available. Absolute accuracy is not claimed for them by any means, but until more reliable figures can be obtained, and with the constant revisions that are being made from time to time, they will probably stand as the official estimates until data from the United States decennial census is made available.

In many of the states the assessors collect acreage data of the various crops, number of bearing trees, etc., that has become fully as reliable as the United States census, and the importance of such yearly estimates of acreage is now quite fully recognized.

Agricultural data in California as now collected by assessors is of doubtful reliability, as attested by a recent report from one county, wherein the total reported area in crops of all kinds is for some 40,000 more acres of land than actually is found in the county. In one of the big citrus counties the assessor's report on the number of bearing orange trees is 563,849 in 1918, compared to a like report in 1910 of 2,537,483, when as a matter of fact there has been at least a 30 per cent increase in the number of trees and 40 per cent increase in production since 1910.

The writer would not like to be understood as criticising the assessors, as he has had some little experience in assessment work and knows some of the difficulties, but when the law prescribes that certain things should be done, the law should also provide the means for the doing thereof. Not until such means have been provided can the assessors' figures on acreage data be made reliable, and we will have to depend more or less on estimates of county commissioners, growers' associations and others with some knowledge of conditions.

The figures on production were made up from the various reports of the County Horticultural Commissioners and checked by the reports from various fruit growers' associations, shipping records, and the condition of the growing crops in the different counties during the past two years.

Like the acreage figures, modifications were necessary, as so many reports were inconsistent with the condition reports and were more or less incomplete, as, for instance, when dried and shipping peaches only were reported, although the production of canning peaches is always heavy. While accurate tonnage figures are impossible, it is believed the estimates on production are consistent and approximately correct for the fruit crops in the different counties of the state.

It will generally be noted that the total production is slightly larger than the estimated disposition of the crop, but in no case does it appear that the difference would be greater than what is actually consumed as fresh fruit and dried or canned for use in the home.

In estimating the disposition of the various fruit crops for the different years the same factor was always used in reducing the dried or canned product to a green basis—as peaches, for instance: five and one-half tons green to one ton dried, and 45 cases canned from one ton green. By the use of such a factor for each fruit it was felt that comparative figures would result which would be just as reliable as though it were possible to reduce each case of fruit to its actual equivalent on a green basis.

Accompanying each table is a short explanatory note, which speaks for itself. In the preparation of the statistical matter concerning the fruit crops, the writer wishes to acknowledge the assistance of not only the county horticultural commissioners, which has already been referred to, but also that of the California Walnut Growers' Association, California Almond Growers' Exchange, California Fruit Growers' Exchange, Associated Raisin Company, Peach Growers' Association, Prune and Apricot Growers' Association, Pacific Fruit Express, Santa Fe Refrigerator Dispatch, and particularly the "California Fruit News," whose annual reports on the canning industry of the state have been drawn upon very freely in checking over estimates relative to the disposition of the various fruit crops.

In conclusion let it again be said that absolute accuracy is not claimed for any of these statistics, but it is claimed that they are approximately correct and will probably stand as the official estimates until more reliable data is made available.

That there will be more or less criticism is to be expected, especially where unreasonable claims have been made concerning high average yields and total production. Constructive criticism is invited at all times, as only by constantly securing new data is it possible to check up and revise any or all estimates on acreage and production and bring such estimates to a substantial and reliable basis, and thus merit the confidence of those who may have use for them.—E. E. KAUFMAN.

HUGE SUM SPENT IN CONTROL OF A DOZEN INSECT PESTS OF THE ORCHARD.

The fruit growers of California are now spending approximately five millions of dollars annually for the control of about one dozen insect pests, in less than one million acres of orchards.

The report on economic poisons used in California during the past season, appearing in the March number of the "Monthly Bulletin," brings out this fact and is the most striking index of the importance of the insect problem that could be had. The insecticides used amount to nearly two and a half millions of dollars, to which should be added the cost of labor, machinery and other expenses.

No greater argument could be had in favor of strong support, both financial and moral, of the service now being given the plant industry of California by the forty or more state horticultural officials and the

fifty county horticultural commissioners and their inspectors than these figures present; for we must not think that we have all the dangerous pests in California. Recently the United States Department of Agriculture issued a publication containing a list of dangerous insects occurring in foreign countries which have not yet invaded this state. This list includes approximately 2,500 different kinds of insect pests, any one of which might, if introduced, add very materially to the five millions of dollars mentioned.

The quarantine service of the State Horticultural Commission has already intercepted numbers of these dangerous pests at our ports of entry as well as at inland stations, in this way saving an amount of money which can not be estimated, but judging from what these same pests cost other less fortunate countries, must be very large.

While the quarantine service is working to prevent any additional pests from gaining entrance and thus to prevent increased cost of pest control, the work with natural enemies of pests already with us has as its object the reduction of expense in controlling those we now have; in other words, the reduction of the five million dollar pest control item. Just how broad its application may be is yet to be determined.

Both these branches of work carried on by the State Horticultural Commission are fundamentally sound, and there is no way in which this state can expend its funds to greater advantage, so far as agriculture is concerned, than to support those lines of work which have as their objective *pest prevention,* and thus avoid any unnecessary addition to its five million dollar *pest cure.*—H. S. S.

CALIFORNIA—THE LAND OF FRUITS.

There are approximately one hundred millions of acres within the borders of the State of California. Of this vast area, which is greater than that of all the New England States and Ohio combined, about 840,316 acres are devoted to the growing of fruit trees at the present time. There is not a single county out of the 58 in California where apples, pears and some of the other more hardy sorts can not be grown. In some counties it is true the industry as yet is undeveloped. Counties having short seasons and located entirely in the mountains are comparable to some of the states to the east and the same fruits may be grown in equally as satisfactory a manner. In other counties may be found all kinds of deciduous fruits as well as citrus.

The missionaries were the first fruit growers of California and more than two centuries ago they demonstrated the adaptability of certain kinds to the conditions existing in their settlements. We owe to the memory of these hardy pioneers the praise and respect which is due to those who have fathered any great industry. They paved the way for us and made possible the tremendous development that has taken place during the last fifty years. California now grows on a commercial scale the following fruits: Almond, apple, apricot, berries, cherry, fig, olive, peach, pear, plum, prune, walnut, avocado, guava, pomelo, date, loquat, mango, feijoa, orange, lemon, lime, persimmon, pomegranate, chestnut, nectarine, quince, grape, currant. Other fruits mentioned by Wickson in his "California Fruits," which have been grown, or

which are being grown experimentally but which have never attained commercial prominence are: Banana, pineapple, cherimoya, chayote, granadilla, jujube, Spanish madroña (strawberry tree), melon shrub, melon pawpaw (melon tree), tuna (prickly pear), white sapota, tree tomato, and Kai apple.

As time goes on, some of the less important fruits mentioned in this list will become important. Varieties of fruits now grown on a large commercial scale will be improved; plantings will be increased as new markets are developed, and the demand increases, and the California fruit industry, notwithstanding its present magnitude and diversity, will assume a place of far greater importance. It is not unsafe to predict that the next fifty years will witness not only a growth, but a stabilizing of the industry, which will be even more striking than its development during the past fifty years.—G. P. W.

BUSHELS VS. SACKS.

The question is often asked, "Why does the Bureau of Crop Estimates persist in estimating crop production in bushels, instead of sacks or hundredweight?"

The bushel is the standard unit of measure throughout the United States. Ninety million people in forty states of the Union think and talk bushels. The bushel measure is definite, and Congress and the various states have stabilized it, enacting laws specifying the number of pounds of the different commodities legally constituting a bushel. The census figures of crop production have all been reduced to bushels for all commodities for which legal weights have been established, and doubtless will be until a different unit of measure has been adopted.

A sack is not definite and can not be made so, except by legal enactment standardizing the volume and then in turn standardizing the weight per volume for the different commodities.

Oranges and apples are thought about and talked about in boxes, dried fruits in pounds or tons, and it is doubtful if custom will permit of a material change. In handling green fruits in large quantities the ton is the most practical unit of measure, but for small quantities the lug box is in general use. As the lug box may hold 30, 40, 50 or even 60 pounds, there is more or less confusion, as market quotations are usually made in lugs without specifying the size.

The cental or hundredweight would seem to be the most practical unit of measure and is quite generally used in buying and selling grain and vegetables. Should the bulk handling of grain ever become general, as now seems likely, the sack will largely disappear and the cental or bushel take its place.

Estimates of average yield per acre and total production will undoubtedly continue to be made in bushels for all grains and some fruits, as long as the bushel continues to be the standard unit of measure throughout the United States.

The following weights per bushel are used by the Bureau of Crop Estimates in all estimates of crop production:

WEIGHTS PER BUSHEL.

	Pounds		Pounds
Apples	48	Barley	48
Beans (dry)	60	Buckwheat	48
Clover seed	60	Flaxseed	56
Corn (shelled)	56	Grain sorghum	56
Corn on cob	70	Onions	57
Oats	32	Peanuts	22
Peaches	48	Potatoes	60
Pears	48	Sweet potatoes	56
Rough rice	45	Timothy seed	45
Rye	56	Wheat	60
Tomatoes	56		

E. E. KAUFMAN.

DATE PALMS IN THE IMPERIAL VALLEY OF CALIFORNIA.

FIG. 62—ONE OF THE OLDEST ALMOND PLANTINGS IN CALIFORNIA. LANGUEDOC VARIETY.

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ALMONDS.

1918.

Bearing acreage	34,972
Nonbearing acreage	15,975
Production (tons)	5,168
Approximate valuation	$1,860,000

CALIFORNIA fruit culture occupies a place when considered from a nation-wide viewpoint that is unique. In the case of a number of fruits the entire commercial production is confined to this state. This is true of the almond, and when this delicious nut is consumed in any state of the Union the consumer may be practically certain that he is eating nuts that were grown either in California, or one of the Mediterranean countries. Professor R. H. Taylor, treating of the almond, states:[1] "California produces over 98 per cent of the entire American crop and has done so for many years." With this situation it might be reasoned that the industry would of necessity bring good profits. In a sense this is true, for orchards located where soil and climatic conditions are favorable to the production of almonds, have been profitable. On the other hand, miscellaneous planting in poorly adapted localities has not resulted in any material increase in production of, or revenue from, this crop.

Acreage—The acreage is somewhat limited because of the absolute necessity of planting only where killing frosts are not apt to occur in the early spring. The almond is the first tree to bloom and belated frosts in the latter part of January or early in February, if they follow a period of warm weather, result in disaster. Despite this fact, we find that the total of 50,947 acres exceeds the total acreage of cherries, figs, lemons, olives, pears and plums.

Yield—The yield per acre is much less on an average than it would be if trees were always well sprayed to control red spider, and so many orchards were not located where crops are uncertain on account of frost. The average yield is approximately 750 pounds per acre, although 1,000 pounds is not unusual and double this amount or more is a possibility.

Prices—Prices have been very well regulated by the California Almond Growers' Exchange. The average for the years 1910 to 1916, inclusive, for all unshelled almonds is given by Professor Taylor as

[NOTE.—In presenting the following data, it is to be assumed that only those fruits which contribute appreciably to the industry of California from a commercial standpoint have been considered. All fruits will grow in the state and many native and exotic fruits are grown in small quantities which have not as yet attained commercial importance.—*Editor.*]

[1]Bul 297, Univ. Cal.

13 cents per pound. This year prices were much higher, ranging from 16 cents for the cheaper varieties to 21 cents for the more expensive.

Varieties—The principal varieties grown are Nonpareil, Drake Seedling, IXL, Ne Plus Ultra, Texas, Languedoc and Jordan. The last-mentioned variety is grown little in California, although it possesses very fine qualities and sells for a high price. Strange to say, no one in America has been able to invent a satisfactory device for cracking the hard shell of this almond without injury to the kernel and it is said that when this secret is discovered the Jordan will become a very popular and profitable nut. In a talk before fruit growers gathered in convention at Napa in November, 1916, George W. Pierce, president of the California Almond Growers' Exchange, made the following statement in connection with the inability of American ingenuity to cope with this problem: "California is going to send an expert to the Mediterranean countries to learn the secret of cracking as it is done there, and when he comes back California will be in the Jordan almond business."

ALMONDS.

TABLE I: *Acreage and production of almonds by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, pounds	Production, pounds	Acres in bearing	Average yield per acre, pounds	Production, pounds
Alameda	264	590	155,760	427	93	39,711
Butte	1,051	666	699,966	4,675	171	799,425
Colusa	201	450	90,450	680	588	399,840
Contra Costa	2,613	318	830,934	2,100	524	1,100,400
Glenn	359	170	61,030	550	182	100,100
Lake	103	459	47,277	150	267	40,050
Los Angeles	962	60	57,720	1,467	96	140,832
Merced	214	535	114,490	800	450	360,000
Napa	234	388	90,792	150	266	39,900
Placer	144	449	64,656	270	111	29,970
Riverside	272	620	168,640	979	952	932,000
Sacramento	829	404	334,916	1,465	546	800,0 0
San Benito	87	849	73,863	139	288	41,032
San Joaquin	1,212	452	547,824	3,255	507	1,650,275
San Luis Obispo	116	405	46,980	4,000	27	118 000
Santa Clara	323	614	198,122	340	300	102,000
Solano	1,228	530	650,840	1,250	489	611,250
Stanislaus	421	281	118,301	2,340	300	702,000
Sutter	769	446	342,974	2,300	304	699,200
Tehama	411	534	219,474	920	144	132,480
Yolo	1,862	596	1,109,752	5,554	218	1,210,772
Yuba	39	501	19,539	250	240	60,000
All others	827	553	457,331	911	250	227,750
The state	14,541	447	6,501,631	34,972	295	10,336,987

NOTE.—Almond trees were reduced to acres, on the basis of 80 trees to the acre. Plantings of late years call for a less number to the acre, but in many of the older and heavy producing orchards the trees are but 20 to 22 feet apart. In the counties of Butte, San Luis Obispo, Stanislaus and Yolo, the increase in bearing acreage has been quite large; the greater part of it however having just reached the bearing age, the average yield per acre is quite low. Over 3,000 acres in San Luis Obispo bore only a few nuts the past year and might with equal propriety be classed as nonbearing.

According to the California Almond Growers' Exchange production for the years named was approximately as follows:

1914	2,250 tons
1915	3,500 tons
1916	3,400 tons
1917	4,000 tons

ALMONDS.

FIG. 63—ALMONDS. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

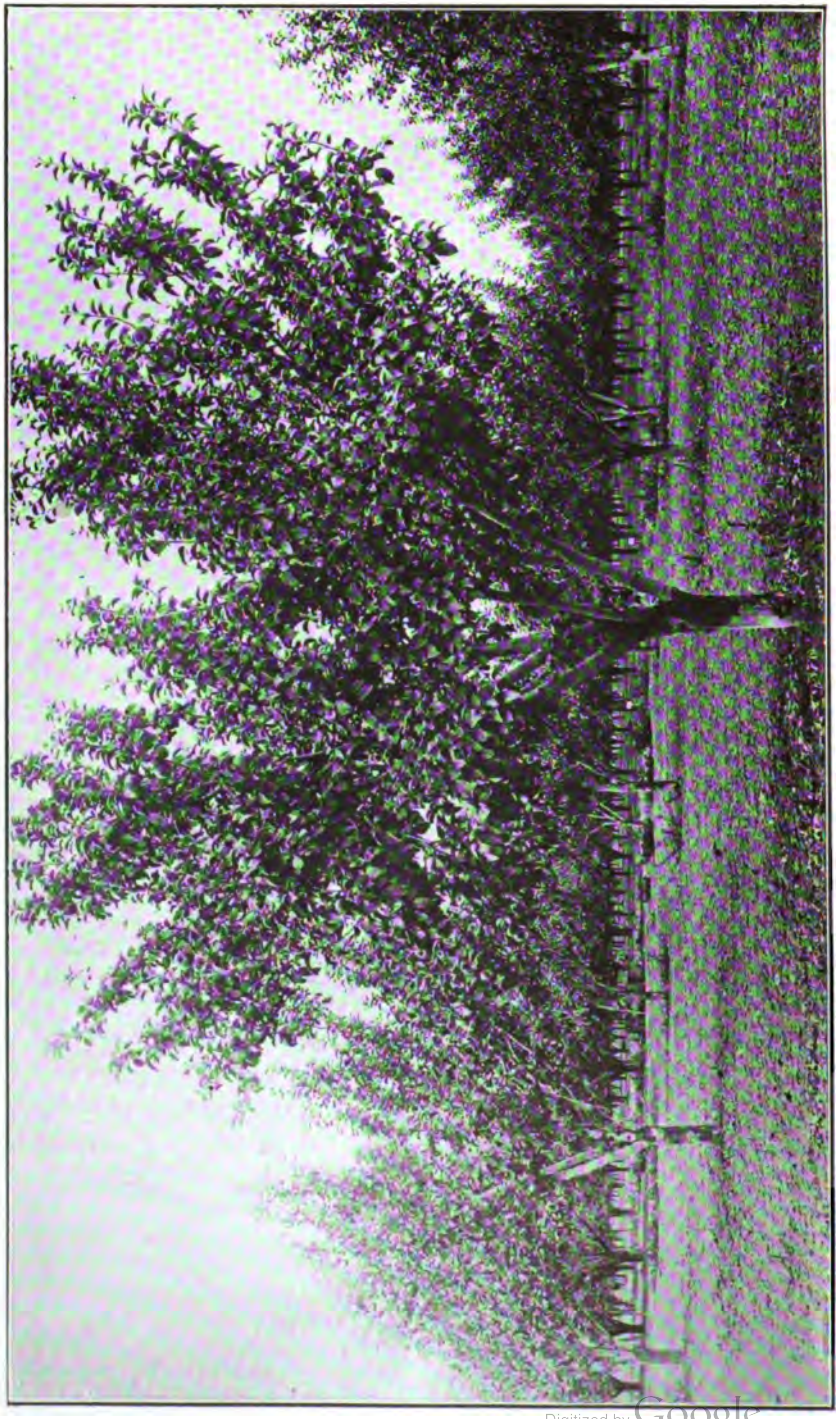

FIG. 64—YOUNG ORCHARD OF APPLES; YELLOW NEWTOWN VARIETY. THIS VARIETY FURNISHES THE HEAVIEST COMMERCIAL PRODUCTION.

APPLES.

1918.

Bearing acreage	43,647
Nonbearing acreage	15,684
Production (boxes)	6,560,138
Approximate valuation	6,000,000

PERHAPS few people realize that apples rank fifth in the bearing fruit acreage of California. Being universally grown, they have not attracted the attention in this state as have other kinds which require special environment and climate such as this state offers for them. Probably no state in the Union can grow successfully so many different varieties of apples. From the time of maturity of the White Astrachan, in June in the lower river sections, to the time of maturity of the highly colored, late varieties in the slopes of the Sierra Nevada Mountains, practically every known variety at some point in the state attains perfection. The wide variation in climatic and soil conditions lends itself to specialization of varieties in different localities.

Varieties—While many varieties are grown profitably in most of the apple growing districts, the prospective apple grower will find in a given locality that the planting in the past ten years has been confined, on a commercial scale, to a very few varieties, usually not more than two or three. For instance, in the Watsonville district, which lies in Monterey, San Benito and Santa Cruz counties, near the Bay of Monterey, one hundred miles south of San Francisco, it will be found that only two varieties are considered of more than passing commercial importance, namely: Yellow Newtown and Yellow Bellflower; in fact, the production of Yellow Newtowns from this district alone is the largest of any single variety for the entire state. Previous to 1914 Yellow Newtowns were extensively exported to England and other European points. The first two years of the war proved to be rather depressing on green apple shipments, but the demand for evaporated apples continually increased until the signing of the armistice. Immediately following this, the demand for fresh apples assumed startling proportions, resulting in prices that were extremely remunerative.

Sonoma and Napa counties have proven to be especially adapted to the Gravenstein, a variety maturing in July and early in August, with exceptional shipping and edible qualities. This variety has a good demand in both European and South American countries. At certain elevations in Tuolumne County and in the southern California apple growing districts, highly colored and good quality fruit of the Winesap and King David varieties are grown. The specialist has every opportunity in California to satisfy his taste and desire in growing apples.

Production—Apples have their share of diseases and insect troubles. However, these are well defined and understood, consequently, there is very little excuse at the present time for the production of low grade apples in any large quantity. Nevertheless, there are people engaged in every business who are not alive to its possibilities and profits, and who are detrimental to those who are striving for the best. This is

especially true of fruit production in California. This condition has resulted in our standardization laws, one of which is the Standard Apple Act of 1917. This act provides for uniform quality and grading. Its enforcement helps to advertise California apples, eliminate hazard in handling and stabilizing prices, thereby increasing the profits of growing this popular fruit food. Largely because of uniform quality and grading, the apple men were in a position to secure maximum prices when the demand came for apples to be shipped overseas last fall.

Evaporating—The demand for canned and evaporated apples, as well as other by-products such as jellies, vinegar, etc., is large; in fact, the by-product demands take a surprisingly large percentage of the total production. In 1918 nearly 7,000 tons of evaporated apples were produced, which was considerably less than in 1917. Santa Cruz and Sonoma counties produce most of the evaporated apples of the state. About seven pounds of the fresh product are utilized in the manufacture of one pound of the dried product. Vinegar is largely a by-product of the evaporation plants, as the cores and peelings are utilized in its manufacture. There is a market early in the season for small green apples that are discarded in thinning, the juice from these apples being made into jellies. It is often combined with high priced berry juices, some of which when mixed with one-half apple juice will retain the berry flavor. The equivalent of 170,000 boxes of fresh apples was canned in the Watsonville district alone, the past season. Probably no other fruit enters into so many different forms of food products, which goes to support the old adage, "An apple a day will keep the doctor away."

APPLES.

TABLE II: *Acreage and production of apples by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, boxes	Production, boxes	Acres in bearing	Average yield per acre, boxes	Production, boxes
Butte	491	87	42,671	553	20	11,060
Humboldt	1,043	1,488	1,552,585	2,300	31	71,300
Inyo	280	127	35,430	1,200	26	31,200
Los Angeles	1,449	82	118,528	1,190	80	95,200
Mendocino	903	125	112,856	700	35	24 500
Monterey	4,148	121	501,847	2,875	238	682,750
Napa	590	80	47,216	1,000	80	80,000
Nevada	288	90	25,800	500	20	10,000
Placer	611	44	26,848	450	40	18,000
Riverside	151	66	9,977	1,213	41	49,762
San Benito	380	90	31,385	150	120	18,000
San Bernardino	787	100	79,077	4,958	40	198,320
San Diego	588	85	45,697	1,598	25	40,160
Santa Clara	1,469	81	118,603	600	120	72,000
Santa Cruz	9,244	226	2,090,968	15,800	240	3,792,000
Siskiyou	443	44	19,520	650	10	6,500
Sonoma	5,525	148	818,725	4,500	258	1,159,200
Tehama	223	73	16,256	280	44	12,386
All others	6,420	89	569,954	3,130	60	187,800
The state	34,983	185	6,263,933	43,647	150	6,560,138

NOTE.—For comparative purposes the number of apple trees as reported by the census was reduced to acres, on the basis of 70 trees to the acre. Some of the older orchards quite likely show closer planting than 70 trees to the acre, but on the other hand many bearing orchards can be found where the trees are planted 30 by 30 feet, making only 48 trees to the acre; consequently it is believed that 70 trees to the acre is a fair average.

The reader's attention is directed to the production and average yield in Humboldt County for 1909. Evidently a serious mistake occurred in the production figure, as one can hardly subscribe to the statement that the apple orchards of Humboldt County bore 21 boxes to the tree and but 3 boxes to the tree in Santa Cruz County. The writer's guess would be that Humboldt County's production should be 155,258 boxes in 1909. Presuming such a guess was correct, the total production in 1909 would read 4,866,606 boxes and the average yield per acre 139 boxes.

The crop of late apples in 1918 was materially increased by the heavy rains of September, causing a pronounced increase in the size of individual fruits, thus to a certain extent upsetting all estimates of total production.

APPLES.

FIG. 65—APPLES. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

FIG. 66—A HEAVY CROP OF THE "ROYAL" VARIETY OF APRICOTS. THIS TREE SHOWS THE DEVELOPMENT OF FRUITING WOOD, LOW DOWN; A DESIRABLE CHARACTERISTIC.

APRICOTS.

1918.

Bearing acreage	40,886
Nonbearing acreage	19,444
Production (tons)	135,787
Approximate valuation	$8,800,000

AS a dried fruit, the California apricot is exceedingly popular; in the fresh state it reaches the market shortly after the first cherries of the season and is highly prized. This fruit is particularly well adapted to the conditions of the coast valleys from Napa County in the north to Orange County in the south. It thrives on the hillsides of both the coast and Sierra Nevada mountain counties, and in the great valleys of the Sacramento and San Joaquin rivers, as well as in the interior of Los Angeles, Riverside and San Bernardino counties, it may be found occupying an important place in the orchard industry. Like the almond, the apricot is essentially a California product, being grown only locally and in rather small quantities in other states of the Union; in fact, in other countries of the world. The apricot drying industry is confined almost exclusively to California.

Acreage—The bearing acreage of apricots is exceeded by that of oranges, peaches, prunes, apples and walnuts. While being adapted to conditions in a wide range of territory, planting should be limited to those localities which are protected from killing frosts in the spring. Blooming of this fruit takes place early, being preceded only by the almond, and otherwise suitable locations may not be desirable because of the frost hazard.

Prices—Prices, like those of other fruits, have fluctuated from season to season. The organization of the prune and apricot growers will, no doubt, have a tendency to steady prices in the future, and the industry may now be said to occupy a permanent and profitable place in the state. The fresh product is packed in baskets, four to the crate, with a total weight of twenty-four pounds. Dried apricot prices were exceedingly high during the season of 1918 because of the war.

By-products—The pits of the dried fruit commanded a ready sale last season at the price of from $30 to $40 per ton, and the supply during the time of the "Great War" has been commandeered by the government for use in the manufacture of gas masks. There is a small amount of cyanogen contained in the pits which also has a commercial value. The demand for pits may never be so great again as it has been during the time of the war, but they have always been a more or less profitable by-product of the apricot drying business.

Varieties—The plantings throughout the state are made up very largely of the following three varieties named in the order of their importance: Royal, Blenheim and Moorpark. Other varieties that are quite commonly met with here and there, and which sometimes do well locally, are: Hemskirke, Newcastle, Tilton and Peach. For general adaptability, satisfactory drying qualities, heavy bearing characteristics and good shipping characters, there is no better variety than the Royal and it is the general favorite for large orchard plantings in the state. Blenheim is a close second. It attains a little larger size than Royal. Moorpark is very large and fine, but bears irregularly in most places, thereby lessening its popularity.

APRICOTS.

TABLE III: *Acreage and production of apricots by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, tons	Production, tons	Acres in bearing	Average yield per acre, tons	Production, tons
Alameda	3,380	2.95	9,976	3,995	4.00	15,980
Contra Costa	485	1.02	497	670	2.68	1,796
Fresno	2,335	2.21	5,163	1,820	4.54	5,992
Glenn	85	.68	58	200	2.00	400
Kern	419	2.92	1,224	292	2.62	765
Kings	1,550	3.77	5,853	2,118	4.67	9,891
Los Angeles	1,534	2.95	4,528	3,430	3.00	10,290
Madera	117	1.31	154	120	3.17	380
Merced	92	1.15	106	120	2.11	253
Monterey	350	2.57	901	520	2.18	1,135
Napa	214	1.90	406	100	2.50	250
Orange	1,617	5.08	8,223	875	2.00	1,750
Riverside	1,038	3.50	3,630	4,252	2.40	10,204
Sacramento	131	1.90	249	550	3.00	1,650
San Benito	771	3.46	2,670	1,054	7.40	7,800
San Bernardino	1,389	3.09	4,294	1,934	1.80	3,481
San Diego	260	3.17	825	247	3.25	814
San Joaquin	662	1.03	686	775	2.60	2,015
Santa Clara	9,794	2.44	23,950	7,600	4.50	34,200
Santa Cruz	788	3.01	2,376	1,200	3.75	4,500
Solano	3,878	1.16	4,500	1,250	2.85	3,563
Sonoma	113	2.29	259	300	3.30	1,000
Stanislaus	255	1.38	353	840	3.50	2,940
Tehama	380	1.72	653	528	1.90	1,003
Tulare	610	2.30	1,403	689	1.00	689
Ventura	2,748	5.12	14,075	3,543	2.00	7,086
Yolo	1,465	1.73	2,535	1,569	2.77	4,370
All others	916	2.01	1,843	795	2.00	1,590
The state	37,376	2.71	101,390	40,886	3.32	135,787

NOTE.—Apricots are one of the most widely distributed deciduous fruits in California, being grown commercially in more than one-half of the counties of the state. While the bearing acreage has increased only 9 per cent since 1909, plantings have been heavy the past few years and a large nonbearing acreage will soon have reached the fruit-producing age.

The tonnage of apricots, aside from home consumption, that can be definitely accounted for in fresh fruit shipments, canned and dried, for the past eight years, is about as follows:

1911	80,466 tons
1912	130,397 tons
1913	76,701 tons
1914	140,372 tons
1915	131,674 tons
1916	90,680 tons
1917	123,689 tons
1918 (estimated)	135,787 tons

APRICOTS.

FIG. 67—APRICOTS. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

FIG. 68—CHERRY GROWING IN THE REDWOODS. THOUSANDS OF ACRES OF LAND ON WHICH REDWOODS ORIGINALLY GREW COULD BE ADAPTED TO THE GROWING OF DECIDUOUS FRUITS.

CHERRIES.

1918.

Bearing acreage	8,616
Nonbearing acreage	5,187
Production (tons)	11,117
Approximate valuation	$1,800,000

THE first deciduous fruit to ripen in California each season is the cherry. Coming as it does at a time when there is a scarcity of other fruits, the first shipments sometimes bring fabulous prices and there is considerable rivalry between certain growers and certain sections to reach the Eastern market with the first cherries of the season. In this rivalry, Solano, Sacramento and Placer counties are chiefly concerned. The trees bloom a little after almonds and apricots and are practically as subject to injury from late season frosts. Planting should therefore be confined to locations that are reasonably well protected. Cherry trees will not stand excessive quantities of water and should never be planted in low lands where water remains in the soil for any length of time. If drainage conditions are good they, however, will stand much more water than in cases where the soil is retentive.

Acreage—The acreage of cherries is the smallest of all the fruits grown in California, except in the case of pomelos and some of the more uncommon fruits as avocados and loquats. The San Francisco Bay region has been the main cherry-producing section of the state throughout the history of the industry. Santa Clara, Alameda, Solano, Sonoma, Napa, Sacramento and Placer are all quite heavy producers of fine cherries. Along the levees of the Sacramento River they do well and some of the very earliest cherries come from such locations.

Longevity—The trees are probably less hardy than most kinds of fruit trees, although there are trees in the state that are more than sixty-five years old. At this age tremendous crops of fruit are borne. Wickson records an average yield of one and one-half tons per annum for a series of years from Black Tartarian trees about thirty years old. Excessively large trees are not apt to be as profitable as those that are younger and smaller. In the case of the latter the fruit is as a rule larger and much more easily and economically picked.

Varieties—Large quantities of cherries are shipped fresh and the fruit from California is greatly prized in the markets everywhere, as there are no finer cherries grown than those that California produces. The white varieties, especially Napoleon (Royal Ann), are very popular for canning purposes and the demand for this particular variety is very great among the canners. The so-called sour cherries or pie cherries of the East, viz: Early Richmond and English Morello are little grown in California. Most of the plantings are of two varieties, Napoleon (Royal Ann) and Black Tartarian. These two are general favorites and no cherry orchard is complete without them. Both are heavy bearers which characteristic with their general hardiness, good quality and altogether satisfactory habits of growth has made them deservedly popular. Not only in the coast valleys are these varieties found making a good growth and producing good crops, but

also in the interior valleys and in the foothills slopes of both the Coast and Sierra Nevada ranges. In Sacramento the writer is familiar with a number of large trees of the Black Tartarian variety, which are regular and consistent bearers of fine fruit.

Other varieties that are found more or less commonly in the state are, Bing, Centennial, Chapman, Purple Guigne, Lambert, Lewelling (Black Republican), Wood (Governor), and May Duke.

CHERRIES.

TABLE IV: *Acreage and production of cherries by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, tons	Production, tons	Acres in bearing	Average yield per acre, tons	Production, tons
Alameda	1,116	2.01	2,242	535	2.13	1,140
Butte	54	2.04	110	79	.20	16
Contra Costa	91	1.41	128	240	1.25	300
El Dorado	41	1.85	76	80	.88	70
Mendocino	15	2.60	39	68	.44	30
Napa	212	2.45	520	250	1.40	350
Nevada	22	2.04	45	70	2.00	140
Placer	390	3.81	1,486	400	3.22	1,289
Riverside	12	1.58	19	262	.16	42
Sacramento	215	3.92	843	500	1.40	700
San Benito	43	1.02	44	80	1.88	150
San Bernardino	38	1.92	73	84	.40	34
San Joaquin	280	1.23	342	1,000	1.00	1,000
Santa Barbara	8	.75	6	10	.40	4
Santa Clara	2,160	1.04	2,250	3,300	.92	3,040
Santa Cruz	220	2.88	634	150	.67	100
Siskiyou	23	1.61	37	80	1.06	85
Solano	673	1.95	1,313	600	2.08	1,248
Sonoma	549	2.67	1,468	520	2.02	1,050
Stanislaus	15	.60	9	58	1.03	60
Sutter	15	1.60	24	42	.95	40
All others	269	1.62	436	208	1.10	229
The state	6,461	1.88	12,144	8,616	1.29	11,117

NOTE.—The number of cherry trees reported by the census in 1909 was reduced to acres, on the basis of 80 trees to an acre, and the production reported in bushels reduced to tons for comparison with 1918.

Increase in acreage has for the most part been small, as the cherry from a commercial standpoint does not seem to be well adapted to all parts of the state. The acreage has apparently been at a standstill for the past four years; new plantings being barely sufficient to take the place of old and unprofitable trees.

The disposition of the cherry crop, aside from the home consumption, for the past four years was approximately as follows:

	1915	1916	1917	1918
Shipped, tons	2,463	1,968	3,960	4,072
Canned, tons	3,046	2,813	7,335	*5,330
Totals	5,509	4,781	11,295	9,402

*Estimated.

CHERRIES.

FIG. 69—CHERRIES. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

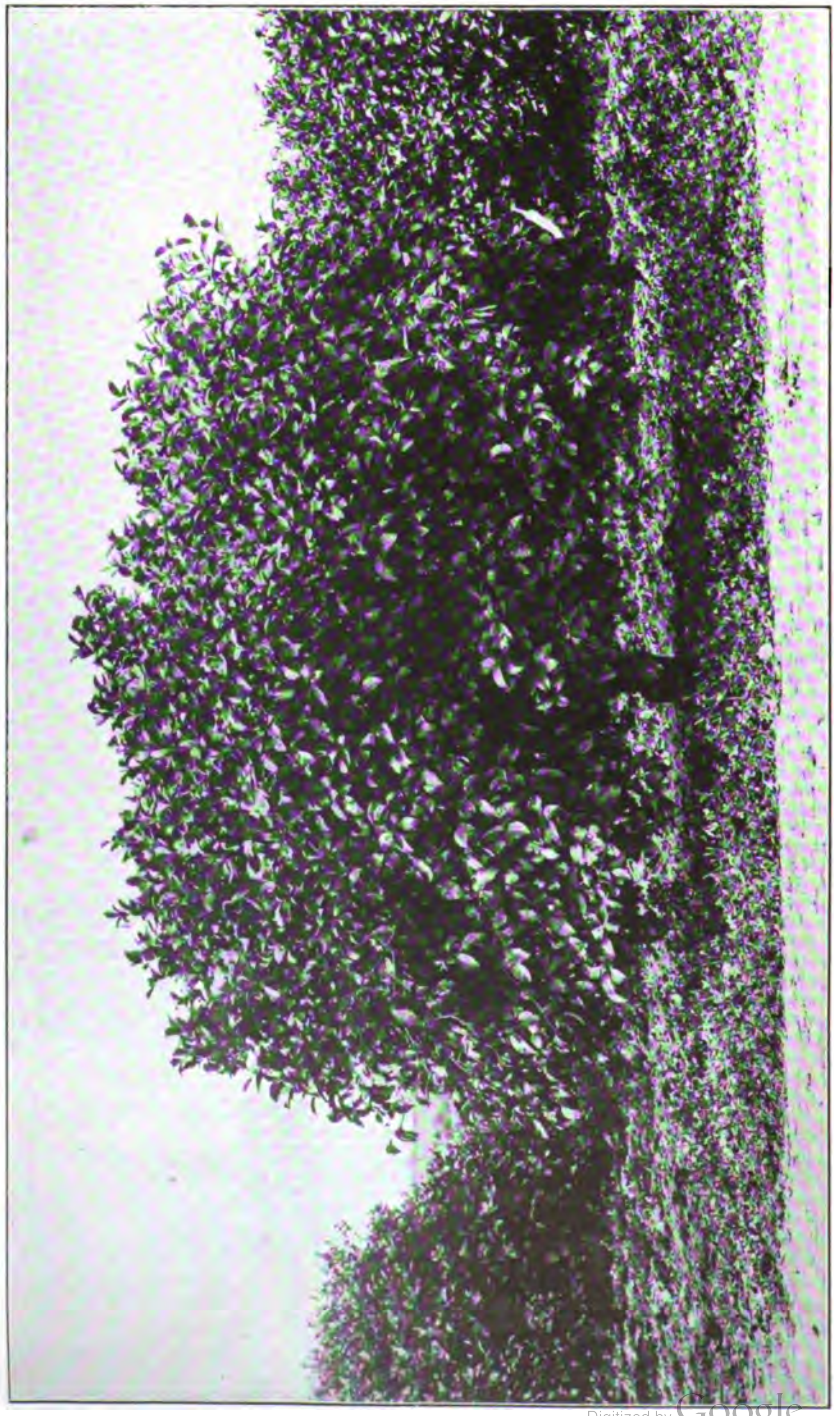

FIG. 70—LARGE LEMON TREE IN A THRIFTY CALIFORNIA GROVE. THIS IMPORTANT CITRUS CROP MAY NOW BE GROWN IN CALIFORNIA IN A LATITUDE AS FAR NORTH AS THAT OF PHILADELPHIA, PA.

LEMONS.

1918.

Bearing acreage	26,744
Nonbearing acreage	15,297
Production (boxes)	3,792,030
Approximate valuation	$19,000,000

AMONG the fruits grown in the United States, there are several whose entire production is confined practically within the borders of the state of California. The lemon is one of the most important of these. There is a limited production of lemons in Florida, but the trade is not over one per cent of the total. The consumption of lemons in the United States is increasing constantly, and while at present the supply does not meet the demand, the new plantings will about equalize things. There are 12,000 carloads consumed in the United States annually. Of this California produces two-thirds, while the remainder comes from southern Italy and Sicily. Italy, Sicily, and California produce practically all the commercial lemons of the world. It would be impossible for California to compete with the Sicilian lemon growers were it not for the protective tariff, because the cost of production in the United States is much greater than in Europe.

Quality—The quality of the California lemon is fast becoming recognized and the trade is increasing annually. If the present conditions obtain in the future, the lemon industry will continue profitable. Lemon growing is, however, an occupation which should not be entered without considerable investigation and forethought, for at its best it is a precarious undertaking.

Frosts and Pests—Frost is perhaps the greatest limiting factor in the production of lemons. No section of the state is absolutely immune and frost protection by artificial means costs considerable. Insect and fungous pests must be watched constantly. Pest control in the citrus groves of California in 1918 reached almost to the $2,000,000 mark. Labor is high and as a general rule inexperienced. It requires training to handle citrus fruits successfully.

Investment—The foregoing statement is not made with the idea of discouraging investment in citrus land. It is given for the purpose of showing the prospective investor what is to be expected. If a prospective grower will take the time and money to study the conditions of soil, climate and market—perhaps we should also add the pests of the locality in which he contemplates settling—he may be able to secure land from which he can realize a valuable return on the capital invested. The financial returns on a citrus grove in the right location are sometimes enormous. There are, however, thousands of acres of citrus fruits in California planted in sections never meant for such tender plants on which money is being lost.

Varieties—The principal varieties grown in the state are the Eureka, the Lisbon and the Villa Franca. The Eureka is the most popular, because it is the hardiest and has the added advantage of being thornless. The bulk of the lemons are grown in five counties,

Los Angeles, Riverside, San Bernardino, San Diego, and Ventura, while Orange, Santa Barbara, and Tulare counties also produce a considerable tonnage of commercial fruit.

Prices—The price of lemons varies with the size. In 1918 the price per box went beyond all expectations. Many boxes sold for $10 and over, while many carloads brought $9 per box f. o. b. shipping point. This condition was, however, somewhat unusual. The average price has been from $2 to $4 a box for the last several years. Since the inauguration of the California Fruit Exchange, the citrus industry has been stabilized and standardized to a high degree. Community packing houses, professional packers and strict grading rules have had a tendency to check excessive waste and have made California lemons popular through the entire United States.

LEMONS.

TABLE V: *Acreage and production of lemons by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, boxes	Production, boxes	Acres in bearing	Average yield per acre, boxes	Production, boxes
Butte	28	44	1,222	35	30	1,050
Fresno	155	65	10,083	150	50	7,500
Glenn				200	31	6,200
Los Angeles	2,740	257	704,301	5,380	210	1,129,800
Orange	587	126	74,227	4,200	153	642,600
Riverside	1,438	212	304,683	3,781	120	453,720
Sacramento	31	53	1,636	25	30	750
San Bernardino	1,973	319	630,108	3,675	116	426,300
San Diego	2,442	194	473,543	4,040	118	476,720
Santa Barbara	577	232	134,168	1,000	110	110,000
Tulare	513	128	65,466	832	90	74,880
Ventura	1,188	293	347,804	3,426	135	462,510
The state	11,672	235	2,747,241	26,744	142	3,792,030

NOTE.—Lemon trees are usually planted farther apart than oranges, consequently lemons were estimated at 80 trees to the acre, as being a fair average. The bearing acreage of lemons has practically doubled in every citrus-producing county in southern California since 1909; Orange County showing the greatest increase of all.

The nonbearing acreage is large, indicating a rapid increase in production during the next few years.

The average number of boxes per acre is notably less than in 1909, which to a large extent is probably due to the great number of trees which have just reached the producing age. Also many orchards of old trees have not entirely recovered from the setback in production occasioned by the "big freeze" of January, 1913.

The estimated production for 1918 is for nearly a million boxes more lemons than has ever been produced in the state.

The lemons marketed in any one year can not always be taken as an index of the total production, as unfavorable weather conditions, like a freeze, may seriously injure fruit grown and ready for picking.

Shipments for the year ended October 31, in the years named below, have been as follows:

1915	2,601,024 boxes
1916	2,712,715 boxes
1917	2,934,292 boxes
1918	2,514,373 boxes

LEMONS.

FIG. 71—LEMONS. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

FIG. 72—OLIVES BORDERING A CALIFORNIA DRIVEWAY.

OLIVES.

1918.

Bearing acreage	18,801
Nonbearing acreage	12,222
Production (tons)	13,801
Approximate valuation	$2,000,000

CALIFORNIA grows almost the entire commercial production of olives in the United States. In recent years Arizona has planted some trees and an industry on a rather small scale is now being developed there. In the early days of the industry planting was done principally with the idea of utilizing the product in the manufacture of oil. Later the pickled green olive became popular. When still later a process of pickling the ripe fruit was discovered, the popularity greatly increased, as there are few people who prefer the green to the ripe olive when they have had a chance to sample the latter. In this state it is seldom that the green pickled olive is served, except when stuffed with pepper; in the East the popularity of the green olive seems greater in some quarters than that of the ripe product. As the ripe fruit becomes better known, its fame will grow and the market is subject to a great increase.

Distribution—The industry is quite well distributed throughout the state, although the damp, coast sections have not proven as satisfactory as inland locations. Tehama and Shasta counties form the present northern limit of profitable olive culture. Most of the counties between Tehama and San Diego have some orchards. The principal production is in Butte, Tehama, Los Angeles, Riverside, San Diego and Tulare counties.

Immunity to frost—Unlike the deciduous fruits, the olive is not subject to injury from late spring frosts, as it does not bloom until all danger of frost is over. On the other hand, trouble is experienced in some sections with early fall frosts, which occur before the fruit is mature enough for the pickled ripe olive. Frost does not injure the olives for oil making, but when badly frozen they can not be used for pickle.

Varieties—In recent years the industry has been profitable in cases where varieties have been good and where good crops are uniformly borne. The larger sizes are best for pickling purposes, and therefore sell at a premium. Because the olive will grow with little attention, many groves may be found which are not cultivated, irrigated, pruned or fertilized. While these groves may bear considerable fruit, it is generally inferior and instead of attaining a good size it is frequently too small for pickles and must be sold for oil purposes. Many old groves of the Picholine variety, planted years ago for oil purposes, are unprofitable today. In some cases these have been top-worked to profitable varieties, such as Mission, Manzanillo, Nevadillo, etc. Six tons is not an excessive yield for a well managed grove of suitable sorts. The varieties that are most popular are, Mission and Manzanillo. The largest acreage is of the Mission variety. It is a high class fruit that is easily handled in pickling. The pulp separates freely from the

stone, which is a point in its favor. Manzanillos are grown quite extensively in the Fair Oaks section of Sacramento County. They are very rich in quality, the flavor being preferred by some to that of the Mission. The pulp does not separate freely from the stone in eating. The variety has been found more subject to injury during the pickling process than the Mission, however, large quantities are being processed and the product is popular. Other varieties that are grown more or less in the state are, Nevadillo, Sevillano (Queen), and Ascolano. These three are much larger varieties than either the Mission or Manzanillo. Their field of usefulness is somewhat limited at present, because of rather light-bearing characteristics, which may be overcome when a better knowledge of cross-pollination and general care has been attained.

OLIVES.

TABLE VI: *Acreage and production of olives by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, tons	Production, tons	Acres in bearing	Average yield per acre, tons	Production, tons
Butte	1,050	1.07	1,121	2,600	.46	1,200
Contra Costa	139	1.22	170	143	1.26	180
Fresno	1,040	.32	328	350	.50	175
Los Angeles	1,213	.64	775	3,388	1.40	4,743
Madera	257	.08	19	240	.88	210
Merced	100	.45	45	250	.60	150
Napa	288	.07	18	140	.50	70
Orange	968	.42	414	160	.58	93
Placer	377	.55	209	320	1.03	330
Riverside	1,151	.56	641	1,417	.45	634
Sacramento	487	1.00	485	900	.90	810
San Bernardino	431	.56	243	657	.38	249
San Diego	1,570	.82	1,280	1,629	.75	1,222
San Joaquin	286	.88	258	60	.67	40
Santa Barbara	632	1.01	638	300	.17	50
Santa Clara	200	1.60	320	230	1.08	248
Shasta	137	.03	4	143	.16	23
Sonoma	155	.18	27	350	.40	140
Stanislaus	78	.83	65	108	1.00	108
Tehama	248	.79	197	1,550	.60	940
Tulare	80	.56	45	2,259	.37	836
Ventura	371	.92	343	436	1.05	458
Yolo	64	2.40	154	131	1.50	197
Yuba	95	.34	32	350	1.00	350
All others	542	.44	238	690	.50	345
The state	11,949	.67	8,064	18,801	.73	13,801

NOTE—The number of olive trees was reduced to acres, on the basis of 70 trees to the acre. The production the past two years has been curtailed by adverse weather conditions at blooming time, the result being only about 50 per cent of a normal crop. The number of tons produced in 1918 according to the above table is larger than expected, but at present writing there is no check that would warrant any change in the county figures.

OLIVES.

FIG. 73. OLIVES. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

FIG. 74—TYPICAL ORANGE TREE; VARIETY WASHINGTON NAVEL. THE HEAVY BEARING HABIT OF SUCH TREES AS THIS IS BEING REPRODUCED THROUGH PROPAGATION FROM SELECTED BUDS.

ORANGES.

1918.

Bearing acreage	116,470
Nonbearing acreage	40,819
Production (boxes)	15,858,939
Approximate valuation	$75,000,000

FROM the standpoint of acreage and production, it may be reasoned that the orange is the most popular fruit in the state of California. The industry began, on a large commercial scale at least, in the southern part of the state. The introduction of the navel variety into the United States from Bahia, Brazil, in 1875, by the United States Department of Agriculture, marks the beginning of an industry in California which represents the greatest branch of the fruit industry, when only a single fruit is considered, that exists in America. The parent trees of this industry are still living and bearing fruit at Riverside. For a time it was thought that the orange was adapted only to the condition of climate south of the Tehachapi mountains. The range of distribution has, however, gradually widened as it has been discovered that certain sections north of Tehachapi, as well as south, would grow good fruit, until at the present time we find Tulare County with a bearing acreage exceeded only by that of San Bernardino and Los Angeles; Sacramento, Placer, Butte, Glenn and Tehama counties each have orchards of considerable size, many of which are being operated at fully as great a profit as those in the southern counties.

By-products—Most of the crop is shipped in the fresh state, although by-product factories utilize quantities of culls in the manufacture of marmalade, orange juice and other by-products. The reputation of the industry has suffered at times from the sale of green, frozen, or otherwise inferior, fruit. Under the standardization law of today these things are being regulated in a very helpful manner, and the public need no longer fear that the fruit which they purchase was not at least approximately mature before picking.

Yield—The production of oranges is usually quite satisfactory, varying, of course, with locality and with seasons. Five tons per acre is considered to be about the average yield. The entire output of the state during a season of normal production on the basis of the present acreage, would approximate 50,000 cars. If placed in one train, these cars would occupy approximately 400 miles of track, or a distance about equal to that covered by the Southern Pacific tracks between San Francisco and Ventura.

Prices—J. E. Coit in his book on citrus fruits published in 1915 states that the average price received for the five preceding years was about $2.80 per box. The Citrus Protective League estimated the average f.o.b. price for the ten years preceding 1915 as about $1.50 per box. In the orange business as in other lines of fruit growing, it may be seen that the average production is away below that of the orchards that receive the proper care.

Varieties—While a number of varieties are grown in the state, there are only two of general popularity, viz: Washington Navel and Valencia. Of the two, the Washington Navel is the far superior orange,

and it occupies approximately three-fourths of the acreage in the state. The Valencia is quite popular in certain sections of the south and is now being grown somewhat in the northern part of the state. It has the advantage of late ripening, which enables it to be placed on the market after the navel season is over. On this account, prices for the Valencia have been on the whole very satisfactory. Other varieties given by Coit as occurring in the state are: Thomson, Buckeye, Navelencia, Nugget, Australian, Mediterranean Sweet, Paper Rind (Paper Rind St. Michael), Ruby (Blood), Jaffa, Joppa, Crafton (Crafton Late). None of this list enters largely into the commercial production, although there are here and there quite a number of trees of some of these varieties.

ORANGES.

TABLE VII: *Acreage and production of oranges by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, boxes	Production, boxes	Acres in bearing	Average yield per acre, boxes	Production, boxes
Butte	1,638	78	128,108	1,800	50	90,000
Fresno	953	97	92,640	1,560	45	70,200
Glenn	54	32	1,728	65	30	1,950
Kern	898	36	32,282	450	15	6,750
Los Angeles	18,608	221	4,124,161	26,300	220	5,786,000
Orange	5,346	235	1,247,905	10,500	240	2,520,000
Placer	299	47	14,103	315	30	9,450
Riverside	11,455	176	2,006,902	17,204	100	1,720,400
Sacramento	514	120	61,517	1,100	35	38,500
San Bernardino	21,680	250	5,425,759	33,551	112	3,757,712
San Diego	1,196	141	167,201	1,629	58	94,482
Santa Barbara	47	260	12,272	75	64	4,800
Tehama	119	67	7,975	235	20	4,700
Tulare	8,902	85	758,465	19,349	75	1,451,175
Ventura	1,463	212	310,235	2,304	130	299,520
Yolo	26	113	2,938	33	100	3,300
The state	73,198	197	14,394,141	116,470	136	15,858,939

NOTE.—The number of trees in 1909 was reduced to acres, on the basis of 90 trees to the acre, to compare with acreage estimate for 1918. The estimated production for 1918 is for the crop grown in 1918 and which will be picked and marketed during the year beginning November 1, 1918, and ending October 31, 1919.

Following is a table of the actual shipments of oranges from California by boxes and varieties, for the year ending October 31, 1917, and the year ending October 31, 1918:

Year ending October 31, 1917—	Navels, boxes	Valencias, boxes	Miscellaneous varieties, boxes
Southern California	11,237,938	4,990,222	788,106
Central California	1,722,134	314,956	11,352
Northern California	308,056		2,118
The state	13,268,128	5,305,178	801,576
Year ending October 31, 1918—			
Southern California	1,546,443	3,965,165	748,742
Central California	815,235	268,801	12,709
Northern California	106,344	245	1,241
The state	2,468,022	4,234,211	762,692

The orange crop marketed as shown for the year ending October 31, 1917, was the largest in the history of the state. The Bureau of Crop Estimates reported it as 98 per cent of a normal or full crop. In addition to the 19,374,883 boxes shipped, about 800,000 boxes were carried over and marketed the first two months of the year ending October 31, 1918.

The 1917-18 crop of oranges suffered from a severe heat wave during June, 1917, which was particularly disastrous to the Navels, as indicated by shipments noted above, and was the smallest since 1900 with the exception of 1913, following the "big freeze" of January that year.

ORANGES.

FIG 75—ORANGES. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

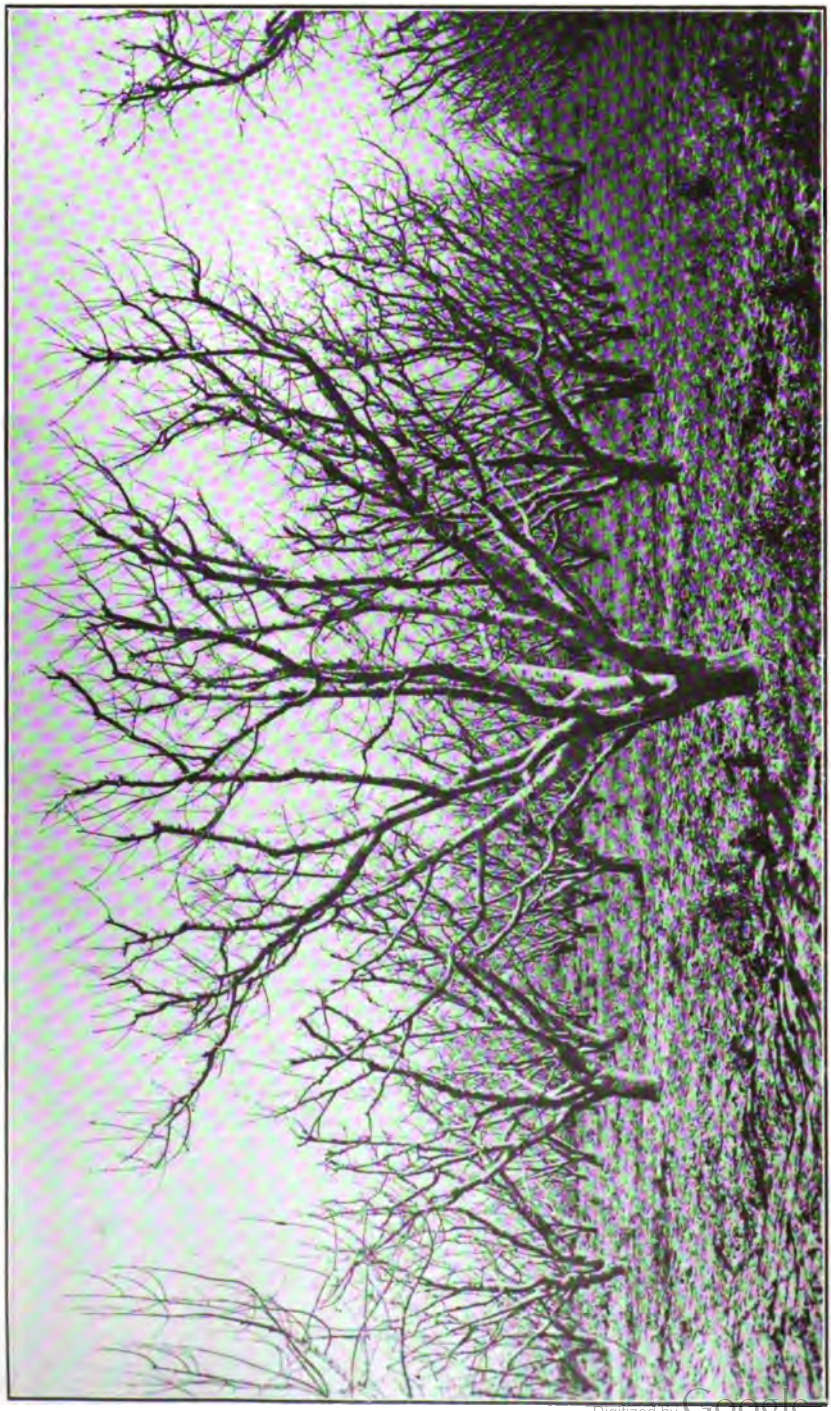

FIG. 76—WELL PRUNED PEACH TREES, PHILLIPS CLING VARIETY. THE TREE IN FOREGROUND HAS PRODUCED APPROXIMATELY 800 POUNDS OF PEACHES IN A SINGLE SEASON, AN AMOUNT FAR IN EXCESS OF THE AVERAGE TREE PRODUCTION. SUCH INDIVIDUALS ARE EXTREMELY VALUABLE FOR PROPAGATING PURPOSES.

PEACHES.

1918.

Bearing acreage	107,575
Nonbearing acreage	12,388
Production (tons)	298,020
Approximate valuation	$11,920,000

THE peach has had its ups and downs in California, but its general adaptability and great popularity assure for it a permanent and prominent place in our horticulture. There are few places in the state where some varieties will not do well. The tendency toward specializing in either shipping, canning or drying varieties is very marked, and one section may be found growing almost exclusively those varieties which are best adapted for shipping purposes, another those that are best adapted for canning purposes, another those that are best adapted for drying purposes.

Choosing a Site—The trees will do well in soil that is not suitable for other orchard trees; for example, shallow hillside soils will grow good trees and good peaches. Also the so-called hardpan soils in the valley may be used satisfactorily for this fruit, requiring in many cases, however, blasting of the holes when planting to break the hardpan strata.

Early Bearing Age—Peaches bloom later than the almonds, cherries or apricots and are therefore not so liable to be injured by late spring frosts. No fruit bears more consistently than the peach, and in suitable locations orchards with the proper care will bear heavy annual crops. Bearing begins at an earlier age than with any other kind of fruit tree. When three years old the trees not only attain considerable size, but will often bear a crop of commercial importance. Their early bearing characteristic makes them a suitable tree for planting as fillers in orchards of slower growing and bearing kinds; for example, olives and walnuts. Five or more crops of peaches may be harvested in cases of this nature before the other trees come into bearing.

Pruning—Heavy pruning is necessary, as all the fruit of the peach is borne on one-year-old wood. An abundance of new growth always results from such pruning, if it is done while the trees are dormant.

Acreage and Production—In point of bearing acreage and production, the peach is exceeded only by the orange. Fresno County leads in acreage and practically the entire crop of this county, as well as other counties in the San Joaquin Valley, is dried. Fresno, therefore, might well be termed the heart of the peach-drying industry of California. Placer County, which ranks second among the counties in point of acreage, is producing shipping varieties almost entirely, and a very large percentage of the peaches which are consumed in the fresh state in California and elsewhere in the Union are Placer County grown. Sutter County has specialized in the growing of canning peaches and most of the production of her orchards, which are of the cling varieties, is manufactured into the exceedingly popular canned peach. The honor of having the largest acreage of canning varieties grown in one county belongs to Sutter.

Varieties—The principal varieties are:

Shipping peaches—Alexander, Triumph, Hale's Early, Yellow St. John, Foster, Strawberry, Crawford's Early, Crawford's Late, Elberta and Salway.

Drying peaches—Lovell and Muir.

Canning peaches—Tuskena (Tuscan Cling), Phillips' Cling, Lemon Clingstone, Orange Clingstone, and McKevitt's Cling.

Of the above list of varieties there are none more popular from the standpoint of the drying and canning industry than Lovell, Muir, and Phillips' Cling, all of which originated in California. Lovell and Muir are perfect freestone peaches with almost a total absence of color surrounding the pit, which is objectionable in drying varieties. Phillips' Cling is grown almost entirely in Sutter County, where it originated, and is justly the most popular yellow cling in the state.

PEACHES.

TABLE VIII: *Acreage and production of peaches by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, tons	Production, tons	Acres in bearing	Average yield per acre, tons	Production, tons
Butte	2,550	3.41	8,699	2,044	2.59	5,300
Contra Costa	395	2.40	949	700	3.00	2,100
Fresno	22,773	2.92	66,536	24,537	3.57	87,644
Kern	351	2.10	739	710	1.13	800
Kings	7,777	2.52	19,601	7,183	3.36	24,130
Los Angeles	1,602	3.57	5,722	6,185	3.00	18,555
Madera	410	1.25	512	1,400	.99	1,377
Merced	1,350	1.64	2,218	4,000	2.77	11,065
Napa	710	2.26	1,606	300	1.07	320
Placer	6,838	3.87	26,453	7,650	2.13	16,310
Riverside	729	2.58	1,881	2,499	2.27	5,692
Sacramento	996	3.18	3,170	2,250	1.43	3,218
San Bernardino	1,978	3.03	6,001	7,354	1.79	13,137
San Joaquin	1,850	3.02	5,590	3,665	4.32	15,860
Santa Clara	4,377	3.20	14,013	4,786	2.00	9,500
Solano	3,413	3.39	11,572	4,200	2.48	10,432
Sonoma	2,372	1.70	4,034	563	.98	550
Stanislaus	1,545	1.41	2,180	6,648	2.50	16,620
Sutter	1,490	4.71	7,022	5,800	3.10	18,000
Tehama	2,600	2.59	6,733	2,294	1.50	3,451
Tulare	7,145	2.12	15,180	6,757	2.86	19,350
Yolo	1,160	4.62	5,358	1,328	3.83	5,085
Yuba	87	1.55	135	335	2.24	750
All others	3,700	2.69	9,948	4,387	2.00	8,774
The state	78,198	2.89	225,852	107,575	2.75	298,020

NOTE.—The above table shows the acreage and production of peaches in 1909 in comparison with the estimated acreage and production in 1918 for the principal peach-growing counties of the state. The figures for 1909 are those of the United States Census—the number of trees being reduced to acreage on the basis of 100 trees to the acre, and production in bushels reduced to tons; the unit of measure generally used in speaking of the deciduous fruit crops throughout California.

Shipments of fresh fruit and an estimate of the tonnage dried and canned definitely account for 272,644 tons of peaches in 1918, while in the above table is shown a production of 298,020, indicating that 25,376 tons were consumed within the state as fresh fruit, canned or dried for use in the home. The tonnage of California peaches which can be definitely accounted for as being shipped outside the state, canned and dried, for the past eight years, is about as follows:

1911	169,794 tons
1912	234,767 tons
1913	208,108 tons
1914	307,220 tons
1915	268,255 tons
1916	272,362 tons
1917	352,894 tons
1918	272,644 tons

PEACHES.

FIG. 77—PEACHES. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

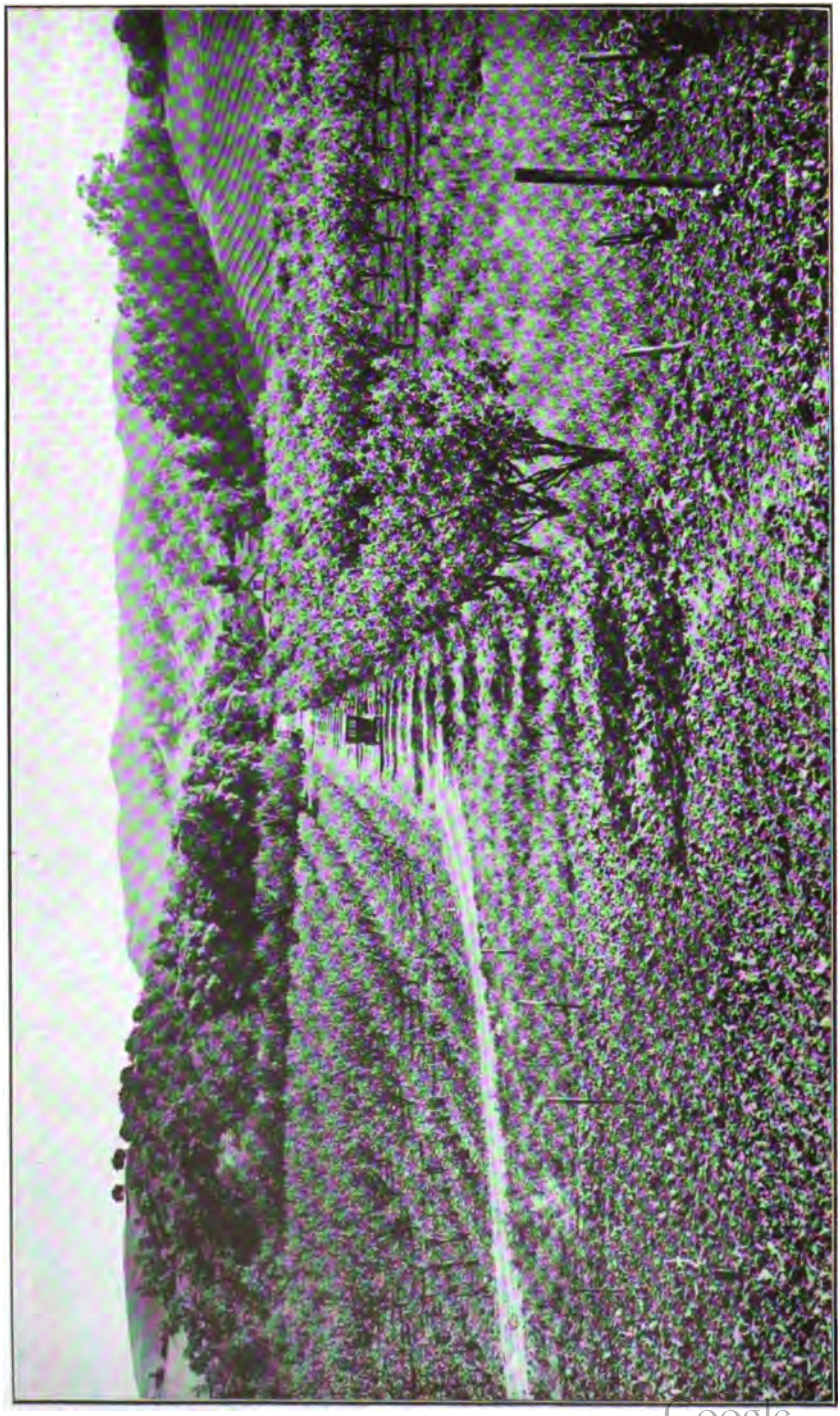

FIG. 78.—TYPICAL CALIFORNIA PEAR ORCHARD: ON RIGHT, STANDARD BARTLETT TREES: ON LEFT, DWARF BARTLETT TREES. DWARF PEARS IN SUITABLE LOCATION MAY BRING IN A GREATER INCOME THAN STANDARD TREES.

PEARS.

1918.

Bearing acreage	22,416
Nonbearing acreage	23,087
Production (tons)	106,073
Approximate valuation	$5,500,000

FOR at least one hundred and fifty years cultivated varieties of pears have been grown in California. While the acreage is not large in comparison to that of most of the other important commercial fruits, the production is heavy, averaging a little less than five tons per acre with reported yields from especially fine orchards of twenty-eight tons per acre.

Attention Required—Planting of pears has been curtailed by the presence of the dreaded disease, blight, which has played havoc in most of the main producing sections. General adaptability and hardiness are such that planting would undoubtedly be as extensive as in the case of peaches, but for the fact that many do not want to take chances on blight which always means, when present in an orchard, a rather expensive fight if it is controlled. Despite the handicap of blight, a great success has been made of the pear business by those who have given their orchards the attention which they require.

Hardiness—Among the long lists of fruits grown in California, there is probably none that is more hardy than the pear, and with the one exception, blight, there is nothing to discourage their planting over very wide areas. The present range of distribution extends from Siskiyou County on the north to Imperial County on the south. In the valleys of both the coast and Sierra Nevada ranges and the great interior valleys, they will grow and produce big crops. On land that is flooded periodically and which will not grow other fruits on this account, pears suffer little or no inconvenience. They are seldom affected by late spring frosts as in the case of almonds, apricots and cherries, as blooming takes place much later.

Early Shipping—Shipping of the earlier varieties begins about the second week of July. The leading variety, Bartlett, ripens first in Sacramento County along the river, about the last week in July and in the later sections it is not picked until September.

Canning and Drying—The canning and drying industries are very important. The surplus Bartletts are always handled by the canneries, and, if a grower has reason to believe that prices for shipping pears will not be good, he can always contract at a good figure with a canner who will take his crop. The dried pear industry is confined very largely at present to Lake County, where the fruit is grown at too great a distance from the railroad to make shipping fresh, profitable, and where drying conditions are ideal. Cull pears which are neither good for shipping nor canning are often utilized by drying. This has had a tendency to lower the standard of the dried product, sometimes to a point where it is doubtful if the sale of the fruit is justifiable.

Varieties—Bartlett far exceeds all other varieties in acreage and production. As a general purpose pear, it is the leader, being uniformly good for shipping, drying and canning. Large orchards of this

variety alone may be found throughout the state. In its planting little attention has been paid to cross-pollination by planting other varieties for that purpose. It is self-fertile to so large a degree that the need has not been recognized by the average planter. However, there is no question about the good effect of pollen of other varieties upon the Bartlett and future plantings should be made with this fact in mind.

Early Varieties—The earliest ripening varieties are, Madeleine (Early Madeleine), Lawson (Comet), and Wilder Early. There is quite a sprinkling of these varieties throughout the state. Other quite generally grown and popular varieties are, Angouleme (Duchess), Anjou, Bosc, Clairgeau, Clapp Favorite, Comice, Dana's Hovey, Easter Beurre, Flemish (Flemish Beauty), Forelle, Glout Morceau, Hardy (Beurre Hardy), Howell, Kieffer, Lawrence, Louise Bonne, Rossney, Seckel, Souvenir (Souvenir de Congress), Vicar (Vicar of Wakefield), White Doyenne, Winter Bartlett and Winter Nelis. In addition to the aforementioned, there are many other varieties that may be found growing here and there, and sometime their popularity may be greater than present knowledge of them will justify.

PEARS.

TABLE IX: *Acreage and production of pears by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, tons	Production, tons	Acres in bearing	Average yield per acre, tons	Production, tons
Alameda	704	3.90	2,750	800	5.45	4,365
Butte	222	2.85	634	280	.88	245
Contra Costa	681	2.78	1,895	900	6.78	6,100
El Dorado	497	1.85	921	1,000	3.28	3,280
Kern	11	2.36	26	200	2.60	521
Lake	391	2.55	997	700	5.00	3,500
Los Angeles	161	3.28	529	834	3.60	3,000
Mendocino	158	3.74	592	450	2.67	1,200
Napa	502	4.07	2,045	750	2.00	1,500
Nevada	368	1.78	657	720	1.91	1,378
Placer	1,430	2.02	2,899	2,150	5.06	10,876
Riverside	184	1.82	335	396	3.06	1,212
Sacramento	1,610	4.78	7,709	3,500	7.45	26,071
San Benito	124	4.61	572	200	6.00	1,200
San Joaquin	137	2.38	327	500	4.80	2,400
Santa Clara	1,425	3.61	5,155	2,100	6.00	12,600
Santa Cruz	231	3.61	836	80	5.00	400
Solano	1,822	4.38	7,982	1,500	5.33	8,000
Sonoma	1,100	2.92	3,210	959	5.85	5,516
Stanislaus	42	1.07	45	161	4.00	644
Sutter	179	4.57	819	109	3.67	400
Tehama	416	1.62	675	734	1.83	1,345
Yolo	381	4.71	1,797	975	3.08	3,000
Yuba	102	6.37	650	550	4.82	2,650
All others	1,191	3.53	4,212	1,868	2.50	4,670
The state	14,069	3.43	48,269	22,416	4.77	106,073

NOTE.—The census figures on the number of pear trees in the different counties was reduced to acres, on the basis of 100 trees to the acre; believing this to be a fair average for all the orchards of the state.

The tonnage of pears, aside from home consumption, which can be definitely accounted for in fresh fruit shipments, dried and canned, for the past seven years, is about as follows:

1912	79,100 tons
1913	55,000 tons
1914	69,100 tons
1915	65,700 tons
1916	88,700 tons
1917	101,600 tons
1918 (estimated)	95,300 tons

PEARS.

FIG. 79—PEARS. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

FIG. 80—PLUM TREE ILLUSTRATING THE EXCEEDINGLY HEAVY BLOOMING CHARACTERISTICS. PLUMS MAY BEAR ENOUGH FRUIT TO BE OF COMMERCIAL IMPORTANCE THE THIRD SEASON AFTER PLANTING.

PLUMS.

1918.

Bearing acreage	17,284
Nonbearing acreage	4,656
Production (tons)	39,368
Approximate valuation	$3,000,000

IN the early days the various varieties of wild plum were eagerly sought and relished by pioneers in different states of the Union. Some of the native varieties were very fine in quality, and the memory of the splendid flavor of the wild plums gathered during boyhood days is very fresh to many of us. They have long been prized for jelly and butter making and even today are preferred by some for such purposes. In the list of improved varieties which are cultivated in California there are some that possess most excellent quality, and are being more greatly prized as their true value becomes known.

The size depends upon variety, location, season and care. In the case of such varieties as Kelsey and Wickson, it is not uncommon for the fruit to become as large as an ordinary sized peach and much larger than the average sized apricot. The larger sizes are more highly prized than the average or small fruits and usually command higher prices.

In California a sharp distinction is made between plums and prunes. Those varieties of plums which are shipped fresh and which usually do not contain enough sugar for drying purposes are known everywhere as plums, while a few plums that possess the characteristics necessary for drying are always known as prunes. These varieties are seldom consumed in the fresh state.

Shipping—As would naturally be expected in the case of so fine a fruit, the shipping plum industry has undergone quite a rapid development in recent years, and the popularity of our plums in the markets throughout the Union is gaining each year.

Acreage—The counties of Placer and Solano each have an acreage which is only a little less than that of peaches, while along the Sacramento and American rivers in Sacramento County and in the Santa Clara Valley the acreage is also considerable. A few are grown in practically every county of the state and the possibility of development on a much larger scale exists. At the present time only the cherry and fig have a lesser acreage in the state. In all the foothill counties of the Sierra Nevada Mountains, there are great possibilities for plum growing. Their hardiness readily adapts them to conditions that are favorable to the apple and pear, and it is safe to predict a much wider commercial distribution in the future.

Hardiness—Like the peach, the plum is very hardy and will do well in general where conditions favor the growing of peaches and apricots. Rather shallow soil on the hillsides lends itself well to their growth; on the other hand, they may be found doing well on the best soils of the inland regions.

Bearing—Trees come into bearing early and the third season should give a fairly good crop. No other tree among our deciduous fruits has as great a tendency to bear heavily and regularly. A great mass

of white perfumed blossoms is developed each spring, thus adding to the enjoyable features of growing this fruit.

Propagation—Most of the plum trees are now grown on the root of the wild or Myrobalan stock. Seedlings are grown from the pits of the wild plum and grafted to the varieties desired. In the past quantities of these seedlings have been purchased by the nurserymen in France. The recent federal quarantine will prevent the importation from foreign countries in the future and no doubt some of the nurserymen in this state will grow the seedlings from the wild plum pits. Seedlings grown from the improved varieties have also been very successfully used as stock for budding and grafting to kinds that are desired. The peach root is sometimes used and frequently nonremunerative peach orchards are grafted to plum. The same is also true of the almond. In either case the union is not as satisfactory as when the plum stock is used.

Early Varieties—The shipping of the earlier varieties begins about the same time as the shipping of apricots, and is extended over a long period before the last of the later varieties is shipped from the higher elevations in the fall.

Drying—Almost the entire output of plums at the present time is shipped in the fresh state. Drying is confined almost entirely to those varieties which contain sufficient sugar to make prunes and which are considered under the heading of prunes instead of in this article.

Varieties—The principal varieties of shipping plums are, Burbank, Climax, Clyman, Damson, Diamond, Formosa, Giant, Grand Duke, Gros, Kelsey, Santa Rosa, Satsuma, Tragedy, Wickson and Yellow Egg. There are many other varieties grown for canning and drying purposes, as well as for fresh shipment in smaller quantities than the above list.

Prices—Prices are generally satisfactory for the better varieties when packed in good condition.

A WELL-TILLED APPLE ORCHARD IN A FAR NORTHERN COUNTY.

PLUMS.

FIG. 81. PLUMS. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

FIG. 82.—CHARACTERISTIC PRUNE DRYING YARD SCENE, IN ONE OF THE PRINCIPAL PRODUCING PRUNE CENTERS OF CALIFORNIA.

PRUNES.

1918.

Bearing acreage	100,721
Nonbearing acreage	34,690
Production (tons)	39,127
Approximate valuation	$5,500,000

THE Petite prune d'Agen or little French prune was introduced into California in 1856 by Louis Pellier, a nurseryman at San Jose. He brought the scions from Ville Neuve d'Agen, France, from which place it takes its name. It was not until 1880, however, that the prune came into commercial prominence. Since that time the fame of the California sugar prune has spread until today it can be found even in the markets of its original home.

Production—California is preeminently fitted to the growing of fruits which can be dried. Eighty-five per cent of all the prunes grown in the United States are in California, and ninety-three per cent of all the dried fruit produced in the United States comes from California. The Santa Clara Valley was the home of the first prune tree and is today the center of greatest production. Her 60,500 bearing acres represent more than one-half of the state's bearing acreage. The second largest producing county is Sonoma, with 8,300 bearing acres.

Culture—Prunes can be grown under a wide variety of conditions, but the maximum production can be secured only where the soil is of sufficient depth and fertility to give a constant supply of food to the roots, and where the climate is not too frosty.

Varieties—There are three varieties usually planted and it is best to have at least two of them planted together to insure complete fertility of the blossoms. The French prune is the heavy producer and the one depended upon for most commercial plantings. The Imperial, sometimes called Imperial Epineuse, and sometimes Clairac Mammoth, is much larger than the French but does not bear so heavily. It is used quite generally as a pollinizer. In some of the northern prune sections, and to a limited extent in the San Joaquin Valley, the Robe de Sergeant is planted. It is especially adapted to the interior valleys, is similar to the French prune, but is somewhat darker and slightly larger.

Acreage—In 1918 there were 100,721 bearing acres of prunes in the state and approximately 35,000 acres coming into bearing. The production prior to the heavy rains of September was estimated to be about 75,000 tons dried, but nearly 50 per cent was ruined by the rains before the growers realized what had happened. The average yield for a productive grove should be not less than one and one-half tons dried to the acre. Well kept groves will yield three to four tons dried, or approximately ten tons green, while exceptional yields will bring five to six tons dried. The acre yield for the state as shown in the accompanying table is low, because all bearing orchards are taken into consideration, and there are many which are just coming into bearing, others which are too old, and still others growing under great handicaps of soil and climate.

Prices—The price received for prunes varies with the size, or number per pound. In 1918, prices were unusually high, due to the unprecedented demand. The United States Government Food Administration fixed the following schedule:

Sizes 20-30—15 cents.
Sizes 31-41—10 cents.
Sizes 42-51— 9½ cents.
Sizes 52-71— 8½ cents.
Sizes 72-101—8 cents.
Sizes 102-121—4½ cents.
Sizes 122 and up—4 cents.

Prunes running 70-80 to the pound are generally taken as the base. During the last five years the base price has been between 5 and 6 cents.

PRUNES AND PLUMS.

TABLE X: *Acreage and production of prunes and plums by counties, 1918.*

County	Prunes—1918			Plums—1918		
	Acres in bearing	Average yield per acre, tons	Production, tons	Acres in bearing	Average yield per acre, tons	Production, tons
Alameda	1,900	.28	532	128	1.56	200
Butte	3,850	.57	2,195			
Colusa	1,200	.29	348			
Contra Costa	900	.33	297			
El Dorado				550	1.20	660
Fresno	680	.30	204	153	2.10	321
Glenn	200	.50	100			
Kern	200	1.00	200			
Kings	1,000	.54	540			
Lake	550	.55	303			
Los Angeles				632	2.00	1,264
Mendocino	570	.53	302			
Napa	4,000	.63	2,520	150	1.67	250
Nevada				120	2.37	284
Placer				6,500	1.95	12,686
Sacramento	900	.40	360	1,700	3.25	5,520
San Benito	1,430	.45	644			
San Joaquin	900	.67	603	800	2.50	2,000
Santa Clara	60,500	.17	10,285	1,500	2.00	3,000
Shasta	400	1.00	400			
Solano	4,345	.36	1,564	2,520	2.97	7,446
Sonoma	8,300	1.54	12,782	75	1.40	105
Sutter	1,128	.44	496			
Tehama	1,632	.49	800	209	.48	100
Tulare	3,286	.61	2,004	519	2.36	1,224
Yolo	1,060	.43	456	641	3.00	1,923
Yuba				200	3.50	700
All others	1,790	.67	1,192	887	1.90	1,685
The state	100,721	.39	39,127	17,284	2.28	39,368

NOTE.—Plums and prunes were combined in the enumeration by the United States Census in 1909 and production reported in bushels on a green basis, thus making it impossible to show comparative acreage and production figures for these fruits.

The production of prunes on September 1, 1918, was estimated at 75,000 tons, but a heavy rainfall twelve days later, followed by a week of cloudy and foggy weather, reduced the tonnage to the figures given in the table.

According to the California Fruit News the production of prunes the past few years has been as follows: 1911, 95,000 tons; 1912, 102,500 tons; 1913, 48,000 tons; 1914, 56,000 tons; 1915, 92,500 tons; 1916, 78,500 tons, and 1917 109,000 tons.

Plums are either shipped as fresh fruit or sold to the canneries. The tonnage that can be definitely accounted for in shipments and canning in 1915 was 28,281; in 1916, 25,394; in 1917, 36,315, and in 1918 will be about 34,800 tons. The tonnage consumed within the state as fresh fruit and for home canning, added to above, will make up the total production of plums.

PRUNES.

FIG. 83—PRUNES. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

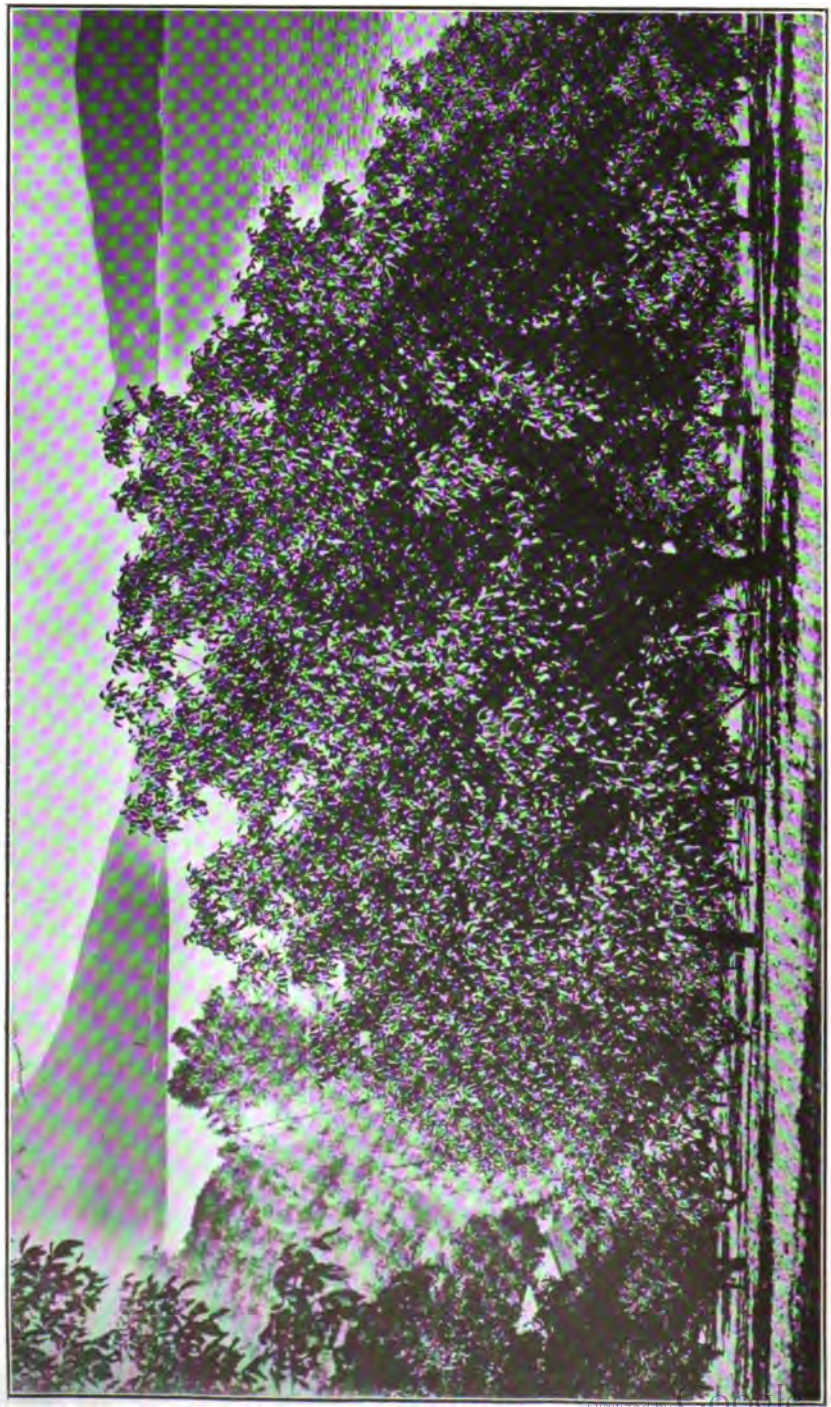

FIG. 84—BUDDED WALNUT TREES GROWING NEAR THE NORTHERN LIMIT OF PROFITABLE PRODUCTION.

WALNUTS.

1918.

Bearing acreage	48,520
Nonbearing acreage	18,809
Production (pounds)	38,924,471
Approximate valuation	$10,500,000

MORE walnuts are raised in California than in any other state or country in the world. France, however, comes a close second. In 1910 the total production of walnuts in the United States was approximately 22,026,524 pounds, of which California produced 21,142,208 pounds. This amount represents about one-half the English walnut consumption of the United States, since imports from European countries, principally France, amount to about 35,000,000 pounds annually.

Bearing—It requires from 8 to 10 years to bring walnuts into bearing. The tree is very long lived and grows to an enormous size. Trees sixty feet high and with a branch spread of sixty feet are sometimes found. It is therefore clear that the best soil conditions are necessary if the trees are to be productive. If planted in good soil where there is a plentiful water supply and no late spring or early fall frosts, the walnut will grow and bear good crops for a hundred years. There has been a growing tendency to plant fewer trees to the acre. The old plantings run from 27 to 35 trees to the acre. Today most new plantings place the trees about 50 feet apart, making about 18 trees to the acre.

Production—A normal tree 10 years old will produce an average of 100 pounds of nuts. Trees 20 years of age will average anywhere from 200 to 400 pounds. It is safe to say that a productive orchard should produce a ton to the acre. Some very productive groves will go as high as 2½ to 3 tons. That all groves in the state are not producing at this rate, however, is shown by the records of the average yield per acre in the accompanying table.

Varieties—Most of the walnuts now being planted in California are grafted or budded on the California black walnut or on hybrid blacks. The principal varieties grown commercially are, the Santa Barbara soft shell (seedling), Eureka, Franquette, Mayette, Concord, Placentia, El Monte, Perfection, Payne's seedling, and Willson's Wonder. The varieties to be planted depend upon the location, climate, etc. Near the coast the soft-shell nuts like the Placentia do well, while in the interior the hard-shell is preferred. Eureka, Franquette, and Mayette are preferred for northern plantings.

Prices—The walnut is not a perishable product and is therefore not as subject to price fluctuation as most fresh fruits. The California Walnut Growers' Association has standardized the product and is expanding the market at a rapid rate. The prices quoted in 1918 were as follows:

No. 1 soft-shell	28 cents
No. 2 soft-shell	25 cents
Fancy budded	31½ cents
Standard budded	29 cents
Jumbos	31½ cents

Investment—Walnut growing has been in certain sections an attractive line of fruit production. There are, however, many things to be carefully considered before making an investment. The trees are long lived, but are of little commercial importance until about ten years of age. The blight is a serious problem, and varieties which are resistant should be selected. While insect pests are few, the walnut aphis, the codling moth and others do considerable damage. Nearness to market is not as important as with fresh fruits, but good soil, water and comparative immunity from late and killing frosts are absolute requisites to success. A thorough study should also be made of bud selection, that trees may be grown from the highest producing strains. There are too many orchards in California which are carrying drone trees that are not productive.

WALNUTS.

TABLE XI: *Acreage and production of walnuts by counties, 1909 and 1918.*

County	1909			1918		
	Acres in bearing	Average yield per acre, pounds	Production, pounds	Acres in bearing	Average yield per acre, pounds	Production, pounds
Alameda	138	334	46,183	112	445	49,840
Butte	39	587	22,893	53	190	10,070
Contra Costa	228	483	110,088	180	478	86,040
Los Angeles	10,438	588	6,138,033	15,572	757	11,794,000
Orange	10.253	730	7,478,955	12,350	1,283	15,849,000
Riverside	112	602	67,491	450	512	230,400
San Benito	51	584	29,784	73	410	29,930
San Bernardino	82	534	43,788	671	262	176,000
San Diego	339	574	194,829	483	174	84,060
San Joaquin	91	72	6,552	700	154	108,000
San Luis Obispo	291	768	223,493	520	181	94,000
Santa Barbara	3,584	747	2,678,039	4,500	789	3,551,000
Santa Clara	706	323	227,955	880	286	251,700
Sonoma	442	325	144,040	250	552	138,000
Stanislaus	32	343	10,976	135	263	36,000
Tulare	72	397	28,584	161	212	34,000
Ventura	3,652	1,005	3,665,935	11,334	678	7,688,700
Yolo	47	424	19,928	46	174	8,000
Yuba	18	259	4,662	50	240	12,000
The state	30,615	691	21,142,208	48,520	829	40,230,690

NOTE.—The number of bearing walnut trees in California has increased about 60 per cent since 1909, while the production in 1918 was 80 per cent greater than in 1909.

Walnuts at the present time are generally planted at the rate of 19 to the acre, but early plantings which are now largely producing nuts were planted much closer together and consequently acreage has been based on 27 trees to the acre; seemingly a fair basis at the present time, but probably not so a few years hence.

Walnut production is apparently not confined to any particular part of the state, but practically no increase in plantings has been made except in the counties of Los Angeles, Orange, Santa Barbara and Ventura, which produced 95 per cent of the crop in 1918, as well as in 1909.

According to the California Walnut Growers' Association the production since 1909 is approximately as follows:

1910	9,600 tons
1911	12,500 tons
1912	11,250 tons
1913	11,350 tons
1914	8,900 tons
1915	14,825 tons
1916	14,600 tons
1917	16,500 tons

WALNUTS.

FIG. 85—WALNUTS. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

MISCELLANEOUS CROP STATISTICS[1]

[NOTE.—Under the heading "Miscellaneous Crop Statistics," there have been arranged alphabetically for the sake of convenience, data on certain fruit, field and vegetable crops. We are indebted to Hon. J. E. Rickards for the field crop data and to Mr. R. G. Risser for that on vegetable crops.—*Editor.*]

ASPARAGUS.

The production of asparagus in California for canning and shipment was comparatively light in 1918. Shipments were especially light, due to cold March weather which delayed the development of grass until other states were shipping and canners were demanding the delivery of the local grass on their contracts with growers. The pack for 1918 as determined by the Food Administration was 874,972 cases. It was the shortest since 1915.

Next to tomatoes, asparagus is the most important vegetable grown for canning in California and there is no other asparagus district in the United States as large as the one in the Delta district of central California.

As the past two seasons have not been normal ones, it is necessary to go back for the past four years to convey a fair idea of the usual production. From records obtained from many sources and checked as closely as possible, the following estimate of production has been computed:

	Stock Used for—		
	Canning, pounds	Shipment and local consumption, pounds	Total commercial, pounds
1915	38,873,280	17,268,500	56,141,780
1916	47,555,520	20,068,500	67,624,020
1917	57,444,576	15,600,000	73,044,576
1918	41,998,650	14,147,500	56,146,150

The first column refers to the product which is consumed in the preserved state, and the second refers to the product which is consumed in the fresh state.

Aside from the Delta district of central California, the Imperial Valley is the location of another important shipping district, and incidental plantings are distributed through several counties.

None of the crop of the Imperial Valley district is at present canned. The production in 1917 was 688,125 pounds, and in 1918, 566,125 pounds.

[1] *Resumé of commercial truck crop production in California for calendar year 1918:* The commercial production of truck crops in California during the calendar year 1918 was not heavy. There were many factors which combined to reduce yields and shipments below normal. In the case of certain crops, however, low yields were offset by good prices which brought the value of the products to the grower up to the usual high level.

While the calendar year does not coincide with the growing season and shipping season for all crops it is desirable for statistical purposes to review the year as a unit. For vegetables which are shipped out during the winter months, the data will necessarily apply to parts of two shipping seasons. Cauliflower, lettuce, cabbage and celery are among the truck crops which are included in this class.

R. G. RISSER, *Assistant Truck Specialist.*

AVOCADO.

In Volume VI, No. 1, of the Monthly Bulletin, Mr. I. J. Condit of the University of California, listed 54 varieties of the avocado that originated in California, and 86 of foreign origin, or a total of 140 named varieties. With this large number to select from, a real problem exists to determine the varieties that are best for California conditions. Already considerable experimental work has been done, and it is now known that there are places that are not subject to frost where certain varieties of avocado will do well.

Commercially the industry is of little importance at present. Fruit sells in the larger cities of the state for exorbitant prices and 75 cents for a single fruit is a price that is frequently paid by the consumer. Prices have been so high that the fruit has not yet become generally known in this country, and there is no way of judging of its popularity, although most people who have tried it sound its praises.

Planting on a small scale is going on steadily, but mostly in the warmer situations in the southern part of the state. Present indications point toward a production in a very few years that will lower prices to a place where other than the rich class can enjoy this fruit.

THE ORIGINAL HOME OF THE WASHINGTON NAVEL ORANGE, RIVERSIDE, CAL.

5—45122

BARLEY.

TABLE XII: *Acreage and production of barley by counties, 1909 and 1918.*

County	1909			1918		
	Acreage	Average yield per acre, bushels	Production, bushels	Acreage	Average yield per acre, bushels	Production, bushels
Alameda	12,650	37.44	473,575	11,500	40	460,000
Alpine	38	38.95	1,480	75	28	2,100
Amador	1,513	19.21	29,071	2,000	25	50,000
Butte	17,705	18.44	326,447	15,000	25	375,000
Calaveras	222	21.77	4,833	500	25	12,500
Colusa	89,985	21.66	1,949,223	150,000	24	3,600,000
Contra Costa	18,665	39.22	731,970	18,665	24	447,960
Del Norte	32	26.25	840			
El Dorado	50	17.68	884	400	23	9,200
Fresno	32,132	21.61	694,334	70,000	26	1,820,000
Glenn	53,513	18.74	1,002,587	60,000	35	2,100,000
Humboldt	1,296	50.92	65,991	500	45	22,500
Imperial	36,986	24.57	908,916	69,760	33	2,302,080
Inyo	678	28.59	19,381	1,000	35	35,000
Kern	32,492	15.91	517,029	25,000	22	550,000
Kings	19,287	20.87	402,432	2,000	30	60,000
Lake	2,825	19.38	54,758	2,000	40	80,000
Lassen	3,244	19.57	63,471	5,000	32	160,000
Los Angeles	32,804	23.93	785,129	20,000	20	400,000
Madera	90,241	12.98	1,170,945	6,000	30	180,000
Marin	16	14.44	231	1,700	30	51,000
Mariposa	1,434	13.34	19,130	500	28	14,000
Mendocino	1,904	22.78	43,370	1,900	45	85,500
Merced	88,145	22.80	2,009,531	110,000	24	2,640,000
Modoc	8,650	26.30	227,473	6,000	35	210,000
Mono						
Monterey	98,923	20.48	2,026,334	55,000	28	1,540,000
Napa	3,048	19.13	58,300	500	25	12,500
Nevada	30	8.30	249	130	35	4,550
Orange	27,384	24.52	671,526	30,000	22	660,000
Placer	1,318	13.00	17,128	3,000	30	90,000
Plumas	1,260	9.70	12,216	500	28	14,000
Riverside	56,946	16.83	958,526	56,000	22	1,232,000
Sacramento	4,599	16.43	75,575	4,000	27	108,000
San Benito	10,955	28.04	307,215	5,500	24	132,000
San Bernardino	3,260	26.22	85,480			
San Diego	17,745	16.04	284,677	12,000	25	300,000
San Francisco						
San Joaquin	125,114	30.59	3,827,187	150,000	26	3,900,000
San Luis Obispo	26,370	25.32	667,718	25,000	24	600,000
San Mateo	917	28.35	26,001	1,000	28	28,000
Santa Barbara	26,294	26.00	683,605	10,000	23	230,000
Santa Clara	8,903	22.56	200,893	3,000	25	75,000
Santa Cruz	1,000	34.23	34,226	300	27	8,100
Shasta	1,298	16.60	21,551	550	25	13,750
Sierra	466	15.80	7,362	75	28	2,100
Siskiyou	4,282	14.04	60,118	3,000	25	75,000
Solano	41,647	30.33	1,263,357	105,000	24	2,520,000
Sonoma	361	24.36	8,795	12,500	23	287,500
Stanislaus	57,529	14.40	828,628	53,000	25	1,325,000
Sutter	27,457	17.91	491,720	30,000	34	1,020,000
Tehama	11,402	15.57	177,518	16,000	26	416,000
Trinity	39	31.03	1,210			
Tulare	27,017	20.49	553,481	10,000	25	250,000
Tuolumne	579	8.73	5,055	1,100	35	38,500
Ventura	10,077	30.73	309,682	6,000	28	168,000
Yolo	49,530	24.97	1,236,884	128,000	27	3,456,000
Yuba	2,901	13.14	36,806	18,000	29	522,000
The state	1,195,058	22.13	26,442,054	1,318,655	26	34,676,840

BEANS.

The acreage devoted to the production of beans in California has increased nearly fourfold since 1909. Probably the largest increase in acreage in any of the principal bean-growing counties was that of Los Angeles, the 1918 acreage being estimated at more than sixteen times that of nine years ago. In Santa Barbara County the acreage devoted to the production of beans has increased about four times, while the increase in Ventura County—which was the principal bean-growing county in 1909—was only about 50 per cent.

The acreage figures by counties have been carefully checked by all available sources of information and are as nearly correct as it is possible to make them at the present time. The total shows 597,000 acres harvested against the estimate of the Bureau of Crop Estimates of 592,000 acres, which can easily be accounted for in the number of counties of 500 acres or less that had not been taken into consideration.

Beginning with 1914 the Bureau of Crop Estimates reported on the acreage, condition and production of the bean crop. The following table shows the estimated acreage and production for the years named:

	Acreage	Production, bushels
1914	215,000	3,875,000
1915	225,000	3,808,000
1916	340,000	5,576,000
1917	558,000	8,091,000

No attempt was made to estimate the production of the different varieties prior to 1917. The following shows the estimated production by varieties for the last two years in centals or 100-pound sacks:

Production by Varieties.

	1917 100-lb. sacks	1918 100-lb. sacks
Limas	1,244,000	1,545,000
Small Whites	800,000	978,000
Large Whites	610,000	618,000
Pinks	1,200,000	721,000
Blackeyes	300,000	463,000
Cranberries	150,000	103,000
Red Mexicans	135,000	154,000
Bayos	125,000	118,000
Red Kidneys	20,000	26,000
Teparies	100,000	257,000
Henderson Bush	116,000	134,000
Miscellaneous	60,000	33,000
Totals	4,860,000	5,150,000

Lima Beans—In 1909 about one-half of the total production of beans consisted of Limas, and while the production of Lima beans in 1918 was larger than any other variety, it only constituted about 30 per cent of the total crop.

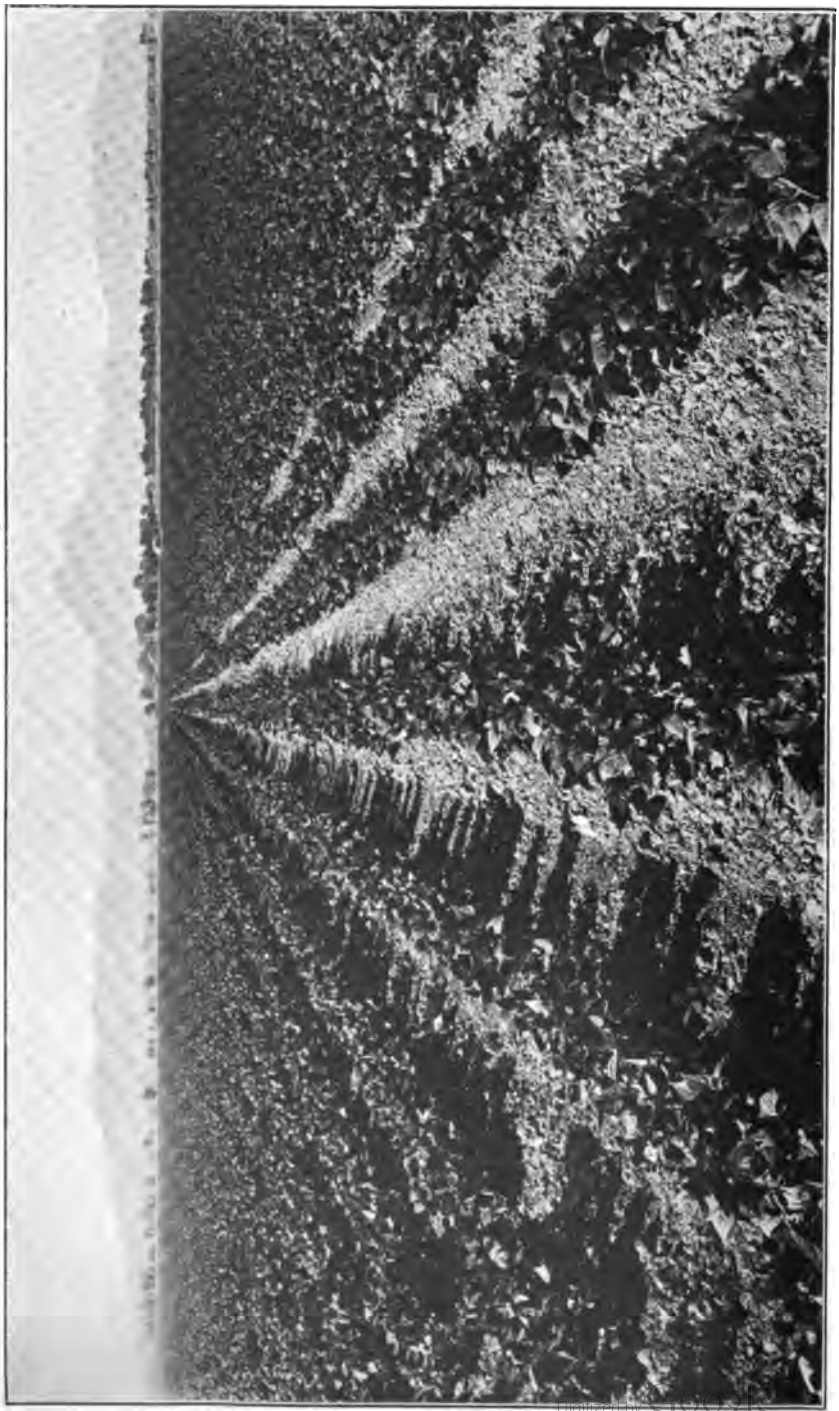

FIG. 86—A GOOD STAND OF BEANS. ALL VARIETIES PRODUCE HEAVILY IN CALIFORNIA.

In the production of Lima beans California takes first rank, producing according to estimates in 1917, 93 per cent of the Lima bean crop of the United States. Limas are grown only in five counties of the state. Estimated acreage and production of this variety in 1917 and 1918 is given in the following table:

	1917		1918	
	Acres	Production, bushels	Acres	Production, bushels
Los Angeles	22,000	264,000	18,000	270,000
Orange	35,000	360,000	40,000	473,000
San Diego	8,000	80,000	14,000	126,000
Santa Barbara	8,000	96,000	8,000	96,000
Ventura	67,000	1,273,000	70,000	1,610,000
Totals	140,000	2,073,000	150,000	2,575,000

It will thus be seen that the county of Ventura alone produces about 62 per cent of the Lima bean crop of California and 58 per cent of the Lima bean crop of the United States.

PRODUCTION IN UNITED STATES.

Owing to the importance of beans for food the production was stimulated to the fullest possible extent when the United States entered the World War.

In the following table is shown the acreage and production of beans in the six leading bean states for 1917 and 1918, as it will be of particular interest to bean growers of California in showing the prominence of the state in comparison with others as a producer of this important food crop:

	1917		1918	
	Acres	Production, bushels	Acres	Production, bushels
New York	250,000	1,875,000	200,000	1,660,000
Michigan	537,000	3,294,000	543,000	4,887,000
Colorado	250,000	1,950,000	252,000	1,638,000
New Mexico	207,000	683,000	149,000	596,000
Arizona	19,000	152,000	18,000	72,000
California	558,000	8,091,000	592,000	8,584,000
Totals	1,821,000	16,045,000	1,754,000	17,437,000

BEANS.

TABLE XIII: *Acreage and production of beans by counties, 1909 and 1918.*

County	1909			1918		
	Acreage	Average yield per acre, bushels	Production, bushels	Acreage	Average yield per acre, bushels	Production, bushels
Alameda	86	34.1	2,933	400	6.0	2,400
Amador	3	10.3	31			
Butte	27	5.6	150	2,400	10.0	24,000
Calaveras	8	29.7	238	50	8.0	400
Colusa	1,083	18.5	20,087	4,000	15.0	60,000
Contra Costa	2,298	28.5	65,748	1,000	7.0	7,000
El Dorado	1	30.0	30			
Fresno	9	17.2	155	850	8.0	6,800
Glenn				800	7.5	6,000
Humboldt	18	21.8	392	750	8.0	6,000
Inyo	70	15.0	1,055	500	8.0	4,000
Kern	76	24.9	648	1,500	6.0	9,000
Kings	21	27.4	576	600	8.0	4,800
Lake				100	6.0	600
Lassen				200	7.0	1,400
Los Angeles	3,874	27.1	105,011	64,500	14.0	903,000
Madera	15	22.0	333	2,000	7.5	15,000
Mariposa	62	6.6	409			
Mendocino	5	8.8	44	200	6.0	1,200
Merced	523	11.1	5,839	11,000	9.0	99,000
Modoc	88	18.0	1,567	100	6.0	600
Mono	5	26.6	133			
Monterey	1,504	19.6	29,532	25,000	6.5	162,500
Napa	6	10.2	61	600	7.0	4,200
Nevada	1	18.0	18	300	7.0	2,100
Orange	21,186	19.0	402,951	58,000	12.0	696,000
Placer				500	7.0	3,500
Riverside	50	3.8	192	10,750	7.0	75,250
Sacramento	7,801	21.4	166,852	25,000	15.6	390,000
San Benito	59	11.5	677	250	7.0	1,750
San Bernardino				8,900	6.0	53,400
San Diego	3,492	13.1	45,661	20,000	8.0	160,000
San Joaquin	13,594	26.0	352,157	37,000	14.4	532 800
San Luis Obispo	11,169	18.6	207,674	21,000	12.0	252,000
San Mateo	466	31.0	14,435			
Santa Barbara	22,355	16.4	367,385	83,000	15.2	1,261,600
Santa Clara	706	12.5	8,810	850	7.0	5,950
Santa Cruz	577	21.9	12,645	1,650	8.0	13,200
Shasta	49	14.0	685	400	7.0	2,800
Siskiyou	10	27.2	272	200	6.0	1,200
Solano	2,553	25.7	65,755	10,000	15.0	150,000
Sonoma	7	11.9	83	450	6.0	2,700
Stanislaus	373	11.8	4,395	38,800	12.2	473,360
Sutter	2,766	27.5	76,201	37,000	13.3	492,100
Tehama	14	21.6	302	650	6.0	3 900
Tulare	21	12.7	267	2,700	6.0	16,200
Tuolumne	3	20.3	61	50	8.0	400
Ventura	58,744	22.4	1,313,156	91,000	24.5	2,238,600
Yolo	1,835	27.9	51,204	28,000	14.0	392,000
Yuba	59	18.8	1,112	4,000	14.0	56,000
The state	157,622	21.0	3,328,222	597,000	14.4	8,594,710

BEETS, SUGAR.

TABLE XIV: *Acreage and production of sugar beets by counties, 1909 and 1918.*

County	1909			1918		
	Acres	Average yield per acre, tons	Production, tons	Acres	Average yield per acre, tons	Production, tons
Alameda	2,516	11.60	29,201	2,750	8.10	22,275
Butte	711	9.81	6,977	2,000	6.10	12,200
Colusa	211	8.64	1,824	1,525	4.50	6,863
Contra Costa	40	6.25	250	820	7.00	5,740
Fresno	228	5.25	1,196			
Glenn	1,264	7.73	9,769	1,300	4.80	6,240
Kern				2,500	5.40	13,500
Kings	504	2.59	1,304	1,000	5.60	5,600
Los Angeles	14,191	11.42	162,059	15,000	7.20	106,000
Monterey	9,900	12.77	126,397	14,000	11.20	156,800
Orange	10,275	13.00	133,612	27,000	8.00	216,000
Riverside				3,050	7.00	21,350
San Benito	283	13.52	3,826	300	8.00	2,400
San Bernardino	4,121	10.42	42,928	933	8.40	7,837
San Joaquin	132	10.82	1,429	9,200	7.00	64,400
San Luis Obispo	284	21.10	5,993	2,396	13.89	33,279
Santa Barbara	11,320	8.02	90,849	4,000	15.00	60,000
Santa Clara	1,135	7.21	8,180	2,400	8.00	19,200
Santa Cruz	312	11.25	3,511	600	9.00	5,400
Stanislaus				800	7.50	6,000
Sutter	27	9.26	250	650	7.50	4,875
Tehama				600	5.00	3,000
Tulare	1,239	7.62	9,447	500	5.45	2,725
Ventura	14,333	10.45	149,715	8,000	8.75	70,000
Yolo	5,714	9.75	55,734	1,625	7.40	12,025
The state	78,740	10.72	844,451	102,949	8.39	863,689

Production of Sugar Beets 1910-1918.

The following table shows the estimated acreage, production, average yield per acre and tonnage of sugar obtained, with the number of factories in operation for the different years:

	Acreage harvested	Average yield per acre, tons	Beets worked, tons	Sugar made, tons	Number of factories
1910	90,500	10.20	923,100	139,890	8
1911	99,545	10.42	1,037,283	161,300	10
1912	111,416	9.01	1,004,328	158,904	11
1913	127,610	8.92	1,138,003	171,208	12
1914	104,000	10.40	1,082,000	169,004	10
1915	122,737	10.20	1,249,111	195,343	11
1916	141,097	10.37	1,462,895	236,322	11
1917	161,909	8.16	1,321,716	209,325	14
[1]1918	102,400	8.24	843,700	109,300	13

[1]Figures for 1918 subject to revision.

FIG. 87—FINE GROWTH OF VINES AND HEAVY YIELD OF WELL-NETTED CANTALOUPES. THE INDUSTRY AT PRESENT IS CONFINED TO A FEW LOCALITIES.

CANTALOUPES.

Growing—Locally the cantaloupe finds conditions of soil and climate favorable and at the present time the industry in California is practically confined to a large area in the Imperial Valley and another area of considerable size with Turlock as its center, but it is reaching out into a number of counties of the Sacramento and San Joaquin valleys.

Early Varieties—The earliest cantaloupes to appear on the markets of the country are grown in the Imperial Valley, the floor of which is all below the level of the sea. Here spring begins very early and cantaloupes are growing during the month of January. The popular varieties that made Rocky Ford, Colorado, famous are grown in California, and are found well adapted to the existing conditions. On the whole, this industry has been profitable. The area under cultivation varies from year to year, and in some sections where at one time there was a commercial production of considerable magnitude, there are now none being grown.

Standardization—Standardization by law has resulted in an improved pack, and has prevented the sale of green melons early in the season. This has stabilized prices and made the industry less hazardous.

Production—The production of cantaloupes in California was less in 1918 than it had been in recent seasons, but was highly satisfactory in a financial way. Shipments from Imperial Valley amounted to 4,402 cars and from the San Joaquin Valley (which includes the Turlock district) 2,439 or a total of 6,841 cars. In spite of the fact that these figures are both short of the previous season the reports as published by the Bureau of Markets indicate that over half of the cantaloupe shipments of the United States were from California. The first car rolled from Imperial Valley in 1918 went out May 25, which is also the average date of the first carlot shipment from Imperial Valley for the past five years. The peak of weekly shipments was reached for the week ending June 24 as 1,311 cars were rolled that week. The highest daily shipments were made June 18 when 230 cars were moved. The last carlot shipment was made July 26. The first car rolled from the San Joaquin Valley in 1918 left the Turlock district July 13. The week of heaviest shipments ended August 5 as 658 cars rolled that week. A few cars were moved as late as the last week in September.

Yield—The average yield per acre in both districts was brought much below the yields of many of the growers due to the fact that there were some fields which were almost failures. Both districts, however, had lighter yields than they usually do. The average yield of shipping stock in 1918 from Imperial Valley as a whole was 136 crates and the average yield of shipping stock from San Joaquin Valley as a whole was 193 crates. The average yield of successful growers, however, was close to 180 crates in Imperial Valley and close to 250 crates in San Joaquin Valley.

CABBAGE.

Cabbage production in California in 1918 was light. The yield per acre was about 50 per cent of normal, due largely to injury from aphis and unfavorable growing weather. The total carlot shipments as reported by the Bureau of Markets for 1918 were 1,078. Approximately 70 per cent of the crop was grown in Los Angeles and Orange counties. The volume moved in mixed cars of vegetables was equivalent to about 500 cars. There was a heavy local consumption, besides a quantity used for canning, kraut manufacture, and evaporation. About 750 cars were shipped from April 1 to July 1, when the heavy movement occurred. The principal varieties grown in southern California were Winningstadt, Cannon Ball and Scotch Cross. In central California the principal commercial varieties were Late Flat Dutch and Early York.

CAULIFLOWER.

The calendar year 1918 was not a good one for California cauliflower. Transportation service the first part of the year was unsatisfactory and growing conditions during the latter part of the year were not inducive to seasonable maturity of the crop. The straight car shipments were 1,872 for the year, 1,279 of which were from southern California and 593 from central California. An equivalent of 300 cars of cauliflower were shipped with mixed vegetables in addition to the straight car movement. As the crop developed too late for the usual shipments of fall and early winter and as the stock which rolled the first part of the year was necessarily culled severely, the production of shipping stock was very light. In spite of the shortage, however, California shipped more than twice as much as any other state.

CELERY.

The total straight car shipments of celery from California for the calendar year 1918 were 2,223. The total movement from California for the season of 1917–8 was 2,775. Florida had the second heaviest shipments with 2,458 cars. New York ranked third with 1,739 cars.

Of the total shipments for the calendar year 1918, 1,475 cars were shipped the first part of the year and 748 were shipped during the latter part of the year. It was during the latter part of the year that shipments were light, the movement during the corresponding period of the previous year being 1.300 cars.

The falling off of shipments from October to the first of January was due primarily to a short acreage. Discouraged by slow transportation, unsatisfactory returns, and high labor costs, growers cut their acreage in two for the season 1918–9. Very heavy rains in September injured many fields in the Delta district of central California, which resulted in about 20 per cent damage. Stock in southern California made slow growth and much of it was shipped while still small.

The heaviest California shipments in 1918 were made the first week in January. January and February shipments were heavier than usual on account of mild winter weather and a large acreage.

The principal celery shipments in 1918 were made from Contra Costa, Sacramento, Los Angeles, San Joaquin, and Orange counties, which are named in the order of their importance as shippers. Other counties of minor importance were Santa Cruz, Alameda, Santa Clara, and San Diego.

PEAR GROWING IN CALIFORNIA.

CHESTNUTS.

Commercially speaking, chestnut growing in California is not of great importance now, but with conditions in many places favorable, and with a tremendous reduction of the Eastern crop, because of loss of trees by blight, there is sure to be a development of this branch of nut growing in California.

Inspection—It is highly important that chestnuts planted in this state should be very carefully inspected, not only at the time of planting but for several years afterward to detect the first signs of the dreaded chestnut blight should it be present. So far it has not been found in the state, and with the future of what will probably be an important phase of our fruit growing looking so bright, no chances should be taken with a disease which in the chestnut-growing sections of the East has practically wiped out the industry, as pear blight has done in some sections where this fruit has been planted.

Distribution—There are a few small commercial plantings in the state that are producing well, and which have been profitable. The California Nursery Company of Niles has an experimental orchard of miscellaneous varieties, some of which are apparently well adapted to the conditions of that section. The writer saw the trees in this orchard just as the burs were breaking last fall, and can testify to the heavy production and fine appearance of certain varieties. They were selling at a good figure and apparently were of good quality. In the Paradise Valley, near Oroville, there is a small orchard of European varieties which is said to be productive. Like in other lines of fruit growing which are only in their infancy, little is yet known about the varieties that are best suited for general planting. As a rule, the European varieties will be preferable to the Asiatic. The latter are much larger, but very much inferior in quality.

The foothills section of the Sierras seems well adapted to chestnut growing. Here and there some very fine trees are growing. In Nevada, Placer and El Dorado counties, as well as others of similar elevation and soil conditions, this nut should do well and be profitable. Where they have been seen, everything has pointed toward successful culture, providing proper varieties are planted and the necessary care is exercised in attending to the trees.

CORN.

TABLE XV: *Acreage and production of corn by counties, 1909 and 1918.*

County	1909			1918		
	Acreage	Average yield per acre, bushels	Production, bushels	Acreage	Average yield per acre, bushels	Production, bushels
Alameda	503	26.03	13,097	800	25	20,000
Alpine						
Amador	301	41.61	12,526	300	35	10,500
Butte	359	41.35	14,856	300	34	10,200
Calaveras	80	22.2	1,776	100	32	3,200
Colusa	706	23.53	16,619	2,000	20	40,000
Contra Costa	263	23.41	6,158	5,250	28	147,000
Del Norte	1	12.00	12	2,000	23	46,000
El Dorado	38	20.21	768	75	40	3,000
Fresno	1,422	26.53	37,726	3,000	29	87,000
Glenn	671	32.93	21,999	500	20	10,000
Humboldt	253	30.16	7,633	250	12	3,000
Imperial	690	20.89	14,419	1,000	40	40,000
Inyo	1,883	30.75	57,917	8,000	39	312,000
Kern	466	15.30	7,132	7,000	30	210,000
Kings	2,274	10.92	43,688	3,000	28	84,000
Lake	981	26 82	26,317	700	25	17,500
Lassen	4	23.25	93	100	25	2,500
Los Angeles	9,084	27.44	249,295	2,000	32	64,000
Madera	1	50.00	50			
Marin	52	39.63	2,061	100	40	4,000
Mariposa	174	13.39	2,330	200	35	7,000
Mendocino	533	27.11	14,454	1,000	27	27,000
Merced	1,877	22.31	52,778	7,500	33	247,500
Modoc	6	34.83	209	1,000	25	25,000
Mono	4	40.00	160			
Monterey	845	18.40	15,552	400	29	11,600
Napa	2,389	24 93	59,579	2,000	20	40,000
Nevada	5	41.60	208	100	38	3,800
Orange	3,054	30.00	91,643	900	41	36,900
Placer	27	39.07	1,055	150	36	5,400
Plumas				100	30	3,000
Riverside	372	33.37	12,421	800	20	16,000
Sacramento	795	42.87	34,089	1,500	20	30,000
San Benito	401	13.41	5,389	500	25	12,500
San Bernardino	920	16.12	14,839	1,000	28	28,000
San Diego	4,544	15.81	71,874	2,000	12	24,000
San Francisco						
San Joaquin	2,547	22.35	57,028	20,000	50	1,000,000
San Luis Obispo	1,509	15.91	24,015	1,000	27	27,000
San Mateo	11	14.90	164	150	20	3,000
Santa Barbara	1,240	20.95	25,979	100	25	2,500
Santa Clara	411	23.82	9,791	300	15	4,500
Santa Cruz	1,136	10.81	22,284	25	21	525
Shasta	163	28.55	4,655	75	26	2,700
Sierra	1	40.00	40			
Siskiyou	89	30.55	3,165	400	36	14,400
Solano	91	10.27	935	500	38	19,000
Sonoma	1,681	26.37	44,331	1,500	30	45,000
Stanislaus	662	18.57	12,297	2,500	46	115,000
Sutter	761	29.39	22,373			
Tehama	100	26 13	2,613	200	32	6,400
Trinity	51	35.94	1,833			
Tulare	2,527	24.48	61,757	2,000	43	86,000
Tuolumne	7	22.28	156			
Ventura	2,409	24.48	58,995	50	20	1,000
Yolo	201	25.48	5,123	80	32	2,560
Yuba	360	15.68	5,645	500	36	18,000
The state	51,935	24.52	1,273,901	85,005	35	2,979,185

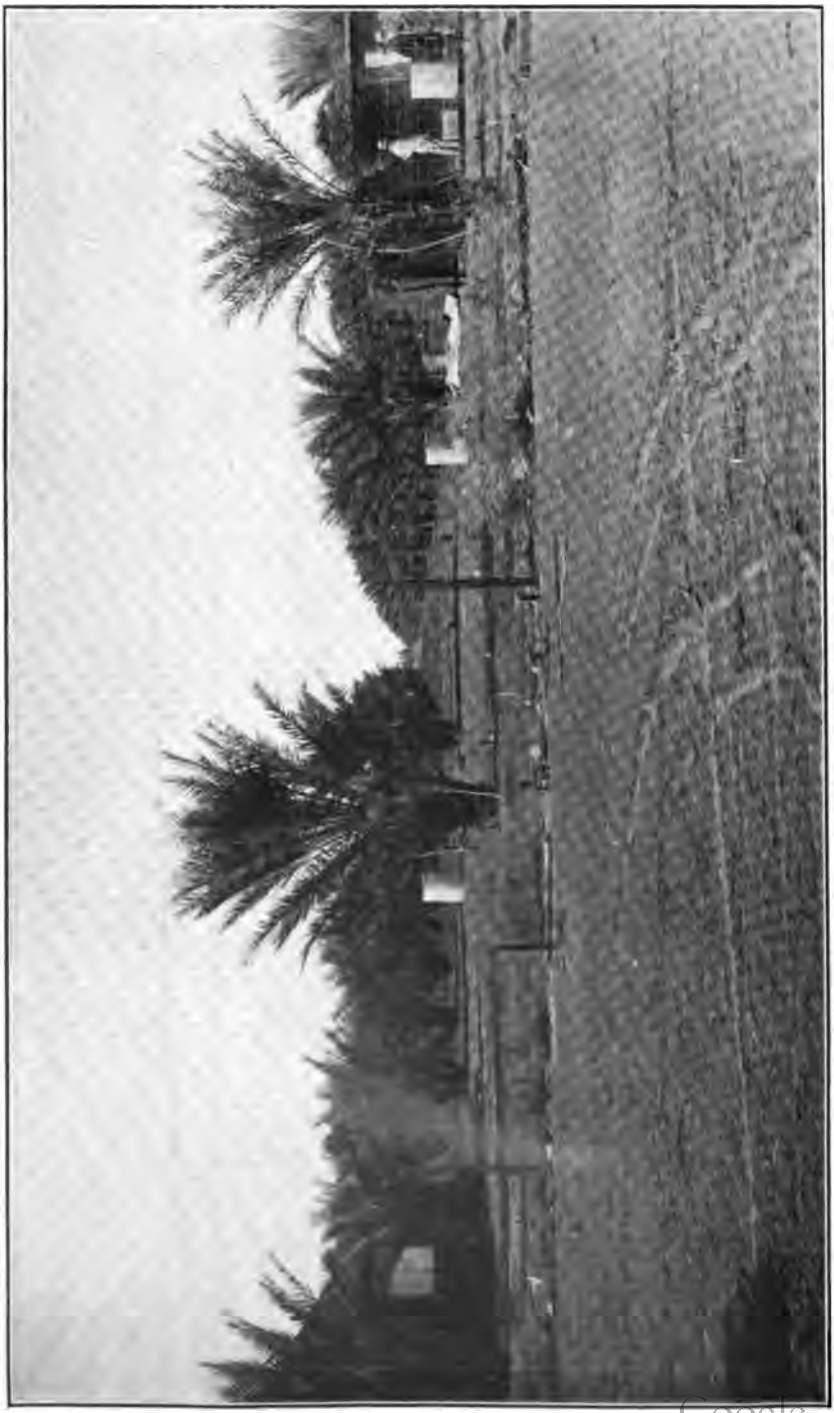

FIG. 88—ONE OF THE OLDEST COMMERCIAL DATE PLANTINGS IN CALIFORNIA, NEAR THE MEXICAN BORDER. DATE CULTURE IS GRADUALLY BECOMING AN IMPORTANT COMMERCIAL PURSUIT.

DATES.

The date industry has made a good beginning in California, since the Bureau of Plant Industry in 1904, cooperating with the horticultural department of the University of California, established an experimental date orchard at Mecca in the Coachella Valley. Closely following the establishment of the first orchard, another was planted at Indio in the same valley during the year 1907. A great many varieties grown in the old world were tested at Mecca and Indio, and the commercial value of the industry has been demonstrated.

Bruce Drummond in Farmers' Bulletin 1016, United States Department of Agriculture, in the "Propagation and Culture of the Date Palm," states:

> "For several years date culture offered little promise of immediate commercial success. Two factors were largely responsible for the doubtful conditions then existing—the difficulty experienced in ripening the fruits and the failure of many attempts to root offshoots of desirable varieties.
>
> "In 1910 a slow-maturation process of ripening the fruit of the Deglet Noor variety was discovered. This gave assurance of successful production in areas of high temperature adapted to the culture of dates of superior quality. The problem of rooting offshoots has now been worked out and no longer offers unusual difficulties."

At present California must necessarily depend upon the imported product to supply the demands. The home industry will soon be developed to a point where the local supply will be adequate for our needs, and in time an extensive commercial industry is assured.

While experimentation on a large scale has been confined to the warmer portions of the state near the Mexican line, smaller experiments have been conducted elsewhere and present indications are that date growing may be practiced in sections farther north.

In a recent issue of the Fresno *Republican* it was stated that Horticultural Commissioner Fred P. Roullard of Fresno County had been studying the date industry adjacent to Fresno, and it was his belief that there is a promising future for the growing of this fruit under the conditions which exist near Fresno.

The public will welcome the California product when it is available, for like all others of our dried fruits it will be handled in a sanitary manner, which is probably not true in the case of most of the dates which come from the Mediterranean region.

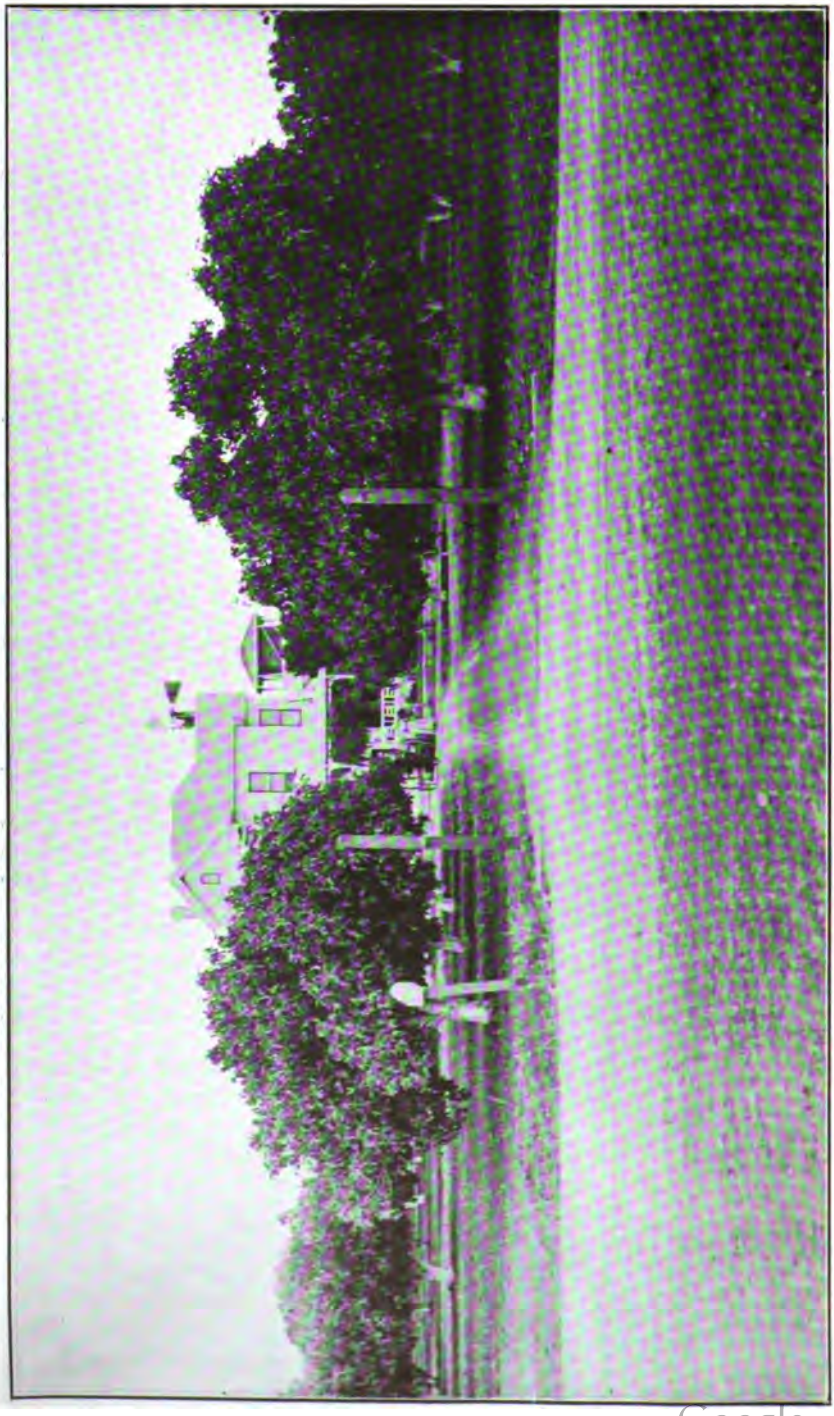

FIG. 89—A PRODUCTIVE SMYRNA FIG ORCHARD IN THE SAN JOAQUIN VALLEY. THIS FIG MAY BE GROWN SUCCESSFULLY OVER A COMPARATIVELY LARGE AREA IN CALIFORNIA.

FIGS.

The Smyrna (*Calimyrna*) fig is well adapted to conditions in parts of California and, since the secret of fertilization by the little fig wasp (*Blastophaga*) has been discovered, there has been a gradual increase in planting until at present a profitable industry has been builded with Fresno as its center. Recently the fig growers have bonded themselves into an organization which will aid in the future development of the industry. In addition to the Smyrna variety there is a considerable production of other varieties, the more common of which are White Adriatic and Black Mission. The field of adaptability for these two varieties is probably much larger than that of the Smyrna, although the latter is gradually pushing out from its present center of production and in the presence of Blastophaga may do well more generally than is now anticipated. In the upper Sacramento Valley the Black Mission variety is in its element. Here the trees attain a tremendous size and produce a second crop of figs in a season. Handling of the Black Mission crop has not been attended with the same amount of care as that which has attended the handling of the Smyrna fig. Thus a cheaper product has been placed on the market, but one which has been quite popular.

The fig tree is attacked by few pests and so far little money has been expended for spraying. One of the chief difficulties which has been encountered in the case of the Smyrna variety is the splitting of the fruit just before maturity. After splitting fermentation takes place and there is a souring which prevents the use of these figs, except by confectioners and in the manufacture of certain by-products.

The high grade and attractive pack of Smyrna figs that characterizes the product of the leading growers has made this variety exceedingly popular. The same care in selection and preparation of the pack of Black Mission and White Adriatic results in a product that compares favorably with the Smyrna fig.

6—45122

FIGS.

FIG. 90—FIGS. COMMERCIAL DISTRIBUTION INDICATED BY SHADED PORTIONS.

GRAPES.

According to the United States Census Bureau, California had in 1909, 144,097,670 grape vines, equivalent to about 260,000 acres, and produced in that year 990,000 tons of grapes. No figures are available from the census enumeration that would indicate just what proportion of this immense grape acreage and production represented table, raisin or wine grapes. The reports made to the State Board of Equalization by the county assessors in 1910 give the total acreage of grapes as approximately 270,000, of which 36,000 acres were table grapes, 109,000 raisin grapes and 125,000 wine grapes, and it is quite likely that this proportion of varieties was about the same at the time of taking the census in 1909.

Reliable data concerning the acreage of grapes in the different counties is difficult to secure, but the most recent—and probably the most nearly accurate—figures would indicate about 50,000 acres of table grapes, 170,000 acres of raisin grapes and 140,000 acres of wine grapes.

Raisin production in California is practically confined to eleven counties, three of which—Fresno, Kings and Tulare—normally produce about 95 per cent of the raisin crop.

The increase in the acreage of raisin grapes for the last few years has been at the rate of about 10,000 acres per year, while the average yield per acre has also shown some increase in the years past.

The following table shows the estimated acreage and production of raisin grapes in the different counties in 1918. The figures on production were supplied by the Associated Raisin Company and can be accepted as the most accurate to be obtained.

GRAPES.

TABLE XVII: *Acreage and production of raisin grapes by counties, 1918.*

	Acres	Production, tons
Fresno	120,000	129,500
Kern	1,500	1,850
Kings	11,000	10,000
Madera	3,000	1,450
Merced	500	225
San Bernardino	1,500	775
San Diego	2 000	250
Stanislaus	1,000	650
Sutter	5 500	1,250
Tulare	23,000	20,750
Yolo	1,000	300
The state	170,000	167,000

The loss from adverse weather conditions during October was quite heavy; probably 20,000 to 25,000 tons.

The Associated Raisin Company reports the production of raisins for the past nine years to be as follows:

	tons
1910	62,500
1911	65,000
1912	95,000
1913	65,000
1914	98,000
1915	127,000
1916	132,000
1917	163,000
1918	167,000

FIG. 91—LARGE MISSION GRAPEVINE WHICH, DURING ITS LIFE OF MORE THAN A CENTURY AND A HALF, SPREAD OVER ONE-EIGHTH OF AN ACRE OF GROUND. THIS HISTORIC PATRIARCH DIED THROUGH INATTENTION AND SUBSEQUENT DAMAGE BY TERMITES

Table grapes are more widely grown than raisins, but the heaviest acreage and production are found in the counties of Fresno, Tulare, San Joaquin and Sacramento. Shipments of table grapes to Eastern markets have more than doubled in the last nine years; the record showing 5,875 cars in 1909, compared to 12,189 carloads in 1918. To this should be added a probable 1,000 cars handled within the state for home consumption, making a total of 13,189 carloads of table grapes the past year. On a basis of 13 tons to the car we have an estimated shipment of table grapes of 171,457 tons. Many thousand tons of table grapes were sent to the wineries, as the quality would not warrant shipment to outside markets.

The average yield per acre for the state is probably about four tons, although individual vineyards yield eight and ten tons.

Wine grapes are more widely grown than table or raisin grapes; the heaviest acreage and production being found in Fresno, San Joaquin, Sacramento, Napa and Sonoma counties. More or less damage resulted to wine grapes in some sections during the heavy rains of September last.

In a recent bulletin the State Viticultural Commission sums up the production of table and wine grapes, and for the latter reports the manufacture of 25,000,000 gallons of dry wine, which required nearly 170,000 tons of grapes. Sweet wine produced was 4,168,240 gallons, obtained from 55,570 tons of grapes. Ninety thousand tons of wine grapes were shipped out of the state, thus making a total production of 315,570 tons in 1918.

LETTUCE.

The production of lettuce in California in 1918 did not come up to expectations. The shipments of straight cars from Los Angeles County were 1,004, and from Imperial County 982, and from the state as a whole 2,062, according to records for the calendar year 1918. In addition, it is estimated that an equivalent of 800 cars were shipped in mixed cars. The local consumption, though difficult to estimate, was also an important factor.

The shipping season for lettuce is longer in California than in any other lettuce state of importance, and carlot shipments went out every month in 1918, but were very light during the summer. The peak of weekly shipments was reached for the week ending March 4, as 215 cars were rolled that week.

The chief reason for the short shipments in 1918 was that weather conditions at certain times was decidedly unfavorable for the production of desirable stock. At certain periods when the demand was strong, as in April and May, the acreage was short. At other times there was an adequate planting but not a strong demand, and as a result some of the fields were not cut.

COTTON.

The United States Census Bureau reports the production of cotton in California in 1909 as 183 bales grown on 324 acres. This acreage was confined to Imperial County, and while for a few years past the growing of cotton has been tried out in other counties, the principal production has been confined to the Imperial Valley.

At the present time more than one-half of the cotton produced in the Imperial Valley is grown in Lower California, but as it is all marketed through California and most of it ginned and baled in California, the Bureau of Crop Estimates has reported both the acreage and production as California cotton, with the explanation that part of it was grown in Mexico.

In the following table is shown the estimated acreage and production of the different districts for the past two years:

COTTON.

TABLE XVI: *Acreage and production of cotton by counties, 1909 and 1918.*

	1917			1918		
	Acreage harvested	Average yield per acre, pounds lint	Production, bales[3]	Acreage harvested	Average yield per acre, pounds lint	Production, bales[3]
[1]Imperial	126,000	237	62,315	160,000	250	83,891
[2]Yuma	1,200	223	560	5,500	340	3,913
Riverside County	8,500	340	6,050	13,000	370	10,063
San Joaquin Valley				1,200	151	380
Sacramento Valley				160	290	97
The state	135,700	243	68,925	179,860	261	98,344

[1]All cotton grown in Imperial Valley.
[2]California only, Yuma Valley.
[3]500 pounds, gross weight.

The cotton first grown in California was of the short staple varieties. A long staple variety known as Durango has been cultivated for a few years in the Imperial Valley and in 1918 nearly 3,000 acres were planted at Blythe, Riverside County. Yuma cotton in 1917 was all Egyptian. Blythe the same year produced 350 bales of Egyptian and the Imperial Valley about 80 bales, making the total production for the state 990 bales.

In 1918 Blythe picked about 400 acres of Egyptian cotton; Yuma, 2,000; Imperial, 3,000; and the San Joaquin Valley, 1,000, with the total production estimated at about 2,800 bales.

Neither the cotton boll weevil nor the Mexican pink bollworm have obtained a foothold in the state, and through the effective efforts of the state quarantine office the likelihood of these pests becoming prevalent is rather remote.

LOQUAT.

The present commercial importance of loquats in California is due very largely to the efforts of Mr. C. P. Taft of Orange, who has developed a number of superior varieties, which are now growing in his own orchards and which are far ahead of the ordinary seedlings for general planting. To date the principal plantings, except for ornamental purposes, are in Orange County, and the fruit from these orchards is marketed locally, although the shipping qualities are good and will permit of shipment to distant markets. It is therefore imminent that the industry will grow.

Unlike all other California fruits, the loquat blooms in the fall, about October or November, and the small fruits have to stand the period of coldest weather of the year. For this reason their adaptability is somewhat limited as far as the growing of the fruit is concerned. On the other hand, the trees are quite hardy and may be found growing, if not fruiting, generally throughout the state.

The loquat is closely related to the apple and pear, and is subject to the dread disease blight, which often plays havoc with the pomaceous fruits.

For ornamental purposes loquat trees are very fine, and their heavy green foliage makes them an object of beauty during all seasons of the year.

Regarding production and prices, the following is quoted from Bulletin No. 250 of the University of California, by Ira J. Condit:

> "Yields and Returns. Loquat trees should begin to bear profitably at the age of five years. A ten-year-old tree should produce 200 pounds of marketable fruit. A fourteen-acre orchard in Orange County, with the trees mostly set 12 by 24 feet, produced in 1912 about 65 tons of fruit, in 1913 only 40 tons on account of frost, and in 1914, a season of very heavy bearing, 80 tons of good fruit. The average price received by the grower has been about 5 cents a pound. A study of the Los Angeles market quotations during the past three years shows that the lowest price for loquats was 2 cents on June 4, 1914, while the highest was 20 cents, on March 27, 1913. Earlier in the season the price has been as high as 35 cents a pound, and the advantage of growing early fruit is thus apparent. The best grade of the Thales loquat brings 10 cents a pound to the grower, while the second grade is sold locally in lug boxes at from 3 to 5 cents."

Varieties described by Professor Condit in above-named bulletin, a number of which were originated by Mr. Taft, are as follows:

Advance, Blush, Champagne, Commercial, Early Red, Eulalia, Giant, Golden, Mammoth, Pineapple, Premier, Staley, Tanaka, Thales, Variegated and Victor.

OATS.

TABLE XVIII: *Acreage and production of oats by counties. 1909 and 1918.*

County	1909			1918		
	Acreage	Average yield per acre, bushels	Production, bushels	Acreage	Average yield per acre, bushels	Production, bushels
Alameda	1,725	31.16	53,745	2,400	40	96,000
Alpine	135	53.88	7,274	50	30	1,500
Amador	1,354	22.76	30,813	1,000	30	30,000
Butte	1,432	38.19	54,685	700	35	24,500
Calaveras	108	19.64	2,121	300	30	9,000
Colusa	771	16.29	12,556	300	30	9,000
Contra Costa	1,112	36.13	40,178	5,000	33	165,000
Del Norte	216	55.92	12,078			
El Dorado	543	19.35	10,504	250	32	8,000
Fresno	1,554	12.89	20,027	500	28	14,000
Glenn	1,283	25.43	32,620	3,000	36	108,000
Humboldt	2,823	26.85	75,803	1,000	40	40,000
Imperial	30	12.40	372	600	32	19,200
Inyo	573	50.39	28,875	2,500	38	95,000
Kern	82	9.39	770	5,000	30	150,000
Kings	109	41.19	4,490	1,200	30	36,000
Lake	843	23.62	19,914	750	45	33,750
Lassen	977	26.25	25,647	1,000	35	35,000
Los Angeles	973	39.79	38,720	10,000	25	250,000
Madera	10,569	16.56	175,047	700	36	25,200
Marin	850	36.98	31,430	600	32	19,200
Mariposa	55	20.00	1,100	250	32	8,000
Mendocino	3,087	26.55	81,959	5,000	42	210,000
Merced	19,843	17.04	338,041	7,300	30	219,000
Modoc	728	30.41	22,138	1,200	40	48,000
Mono	42	71.43	3,000			
Monterey	8,734	27.57	240,760	5,500	32	176,000
Napa	1,366	23.54	32,155	5,000	30	150,000
Nevada	119	13.10	1,559	1,000	40	40,000
Orange	995	31.01	30,858			
Placer	3,030	13.33	40,397	4,000	33	132,000
Plumas	2,193	34.48	75,606	4,800	35	168,000
Riverside	3,767	22.71	85,540	8,000	25	200,000
Sacramento	4,174	16.04	66,949	12,000	30	360 000
San Benito	776	17.82	13,826	7,000	30	210,000
San Bernardino	436	38.07	16,598			
San Diego	7,690	23.08	177,485	1,000	31	31,000
San Francisco						
San Joaquin	23,208	17.09	396,661	10,000	30	300,000
San Luis Obispo	1,139	31.51	35,884	6,000	45	270,000
San Mateo	16,125	28.68	462,566	9,000	32	288,000
Santa Barbara	9,494	24.56	233,171	750	30	22,500
Santa Clara	247	38.15	9,424	200	40	8,000
Santa Cruz	2,282	26.21	59,812	3,000	31	93,000
Shasta	723	12.33	8,915	600	30	18,000
Sierra	526	21.73	11,431	500	30	15,000
Siskiyou	3,148	29.57	93,076	2,800	30	84,000
Solano	1,306	19.69	25,711	10,000	30	300,000
Sonoma	468	43.07	20,156	10,000	37	370,000
Stanislaus	38,546	17.86	688,542	9,000	32	288,000
Sutter	3,568	15.93	56,823	3,000	30	90,000
Tehama	1,032	27.27	28,138	2,500	30	75,000
Trinity	150	17.78	2,667	750	30	22,500
Tulare	1,281	19.92	25,524	3,000	30	90,000
Tuolumne	425	17.52	7,447	400	40	16,000
Ventura	1,138	24.52	27,901			
Yolo	515	24.01	12,365	1,000	35	35,000
Yuba	1,740	18.30	31,834	4,000	30	120,000
The state	192,158	21.56	4,143,688	175,400	32	5,625,350

ONIONS.

While onions are considered one of the leading truck crops grown in the United States, there were only nine states in 1918 which grew more than 1,000 acres of onions. If the acreage of early, intermediate and late varieties is included, California grew a larger acreage of onions than any other state except Texas. If the quantity used for local consumption, distant shipment, storage, evaporation, and seed production is considered, the production of onions in California in 1918 was larger than in any other state. This was in spite of an abnormally poor season in California and an unusually favorable season in some of the eastern competing states. There is not a month in the year in which onions are not being grown in one or more of the important commercial districts, nor a month in the year when they are not being shipped from one or a dozen loading points. While the largest areas of onions are concentrated in a few well defined districts, twenty counties in the state produced sufficient for straight car shipments. The most important districts for the Bermuda type are Riverside and Imperial counties; for the intermediate type, San Joaquin, Yolo and Sacramento counties; and for the late or main crop, San Joaquin, Contra Costa, and several other counties. While the Bureau of Markets definitely accounts for but 4,008 cars shipped during the calendar year 1918, this does not cover the total production of the state.

Acreage Past Two Seasons.

	1917	1918
Bermuda type: Early onions of Southern California	1,250	1,412
Intermediate type: Early reds and yellows of Central California	1,500	1,300
Late type: Main crop of Central California	8,700	9,400

The latter includes the acreage of bulbs grown under contract for seedsmen.

PERSIMMON.

The persimmon is not native to California, and the trees which are so familiar in the pasture lands in many of the Eastern and Southern states are not known here. There has been, however, considerable planting of Japanese varieties which are much larger than the native persimmon of the East, and which are relished by some people, though not generally popular. Like the pomegranate, the persimmon will probably become more popular as its uses are better known and as superior varieties are produced.

Its beauty compares favorably with that of the orange, and the yellow or golden fruit is prized for decorative purposes.

The planting of persimmons is gradually increasing and a small commercial industry has been developed in certain sections, notably Placer County. The trees do well generally in the state.

POMEGRANATE.

This fruit which was so well known in Biblical times and which still occupies a prominent place in the fruit industry of the old world, has never become very popular for eating purposes in California. The Orientals relish it and here and there may be found some of our own people who believe it to be a good fruit, but generally speaking it is considered much more valuable for decorative than for food purposes. Some varieties take on a beautiful pink color when ripe and are certainly valuable for use in decorating banquet tables, fruit baskets, etc.

In Volume V, No. 4, of the Monthly Bulletin, an article written by Mr. R. W. Hodgson, was published. This article brings out many interesting facts in connection with the propagation, culture and varieties of this fruit. Five varieties only are listed as being commonly found on the market, viz: Wonderful, Paper-shell, Spanish Ruby, Sweet Fruited, and Subacid.

The trees, or as they might well be termed, bushes, are hardy and may be found growing in various locations throughout the state. The better varieties possess considerable merit and will become more popular as their uses become better known. The juice is sometimes made into a drink similar to grape juice.

POMELO (GRAPEFRUIT).

The pomelo is not grown generally throughout the state at the present time. There are some very fine groves of this fruit in San Bernardino, Riverside and Los Angeles counties, and here and there in other counties where citrus fruits are produced may be found a few trees or few acres at most.

The California pomelo has not as yet gained as great popularity as the Florida fruit. There is every reason to believe that better varieties or improved strains of varieties now grown would bring this fruit into greater prominence in the state. The Marsh Seedless variety is generally grown in the sections where the industry is conducted on a commercial scale. It may be said that this variety is the most successful that has been tried thus far. Through bud selection it is probable that great improvement can be brought about, and the tendency to thick skin and lack of sugar may be overcome.

Grapefruit is becoming quite popular and the consumption has increased greatly during recent years. It may be safely predicted that the market for this fruit will never be as great as for oranges and lemons, nevertheless the industry is not yet overdone in California and considerable development is possible without seriously disturbing market conditions.

There are no figures available in this office on acreage and production of the pomelo.

POTATO.

The great importance that the potato possesses as a staple article of food can only be appreciated in times of excessive prices, such as those which obtained during the war. The potato is a universal food, and whatever else may be absent from the ordinary dinner bill of fare, the potato is present.

There are great areas of land in California that are particularly well adapted to the growing of potatoes, both for seed and table uses. The chief production has been confined to the great Delta region of San Joaquin, Sacramento and Contra Costa counties, where the loose peat soils have yielded good crops.

At the present time the production is rather low, as may be seen from the table. This may be accounted for from the fact that well selected seed of a heavy producing strain has been hard to get, and that which the planter has been obliged to use has not given the best results. Another factor entering into the decrease in yield is the too frequent cropping to potatoes without rotating with other crops. Also diseases and insect pests have been responsible for quite heavy losses in some cases.

The future of the industry looks bright, although more scientific methods will have to be adopted in the selection and care of seed, as well as in the matter of rotation and the control of diseases and insects. From Siskiyou and Humboldt in the north to San Diego in the south, there are thousands of acres both in the mountains and inland which will grow some varieties well.

The seed industry is badly in need of attention. Inspection of fields for certification has begun in a small way and it is hoped that the present legislature will provide funds which will enable this commission to enlarge upon the certification work.

The red soils of some of the foothill counties on the west of the Sierra Nevada mountains are well adapted for seed growing purposes. In the hills of the Coast Range, in Sonoma, Mendocino and Humboldt counties conditions are also favorable.

Early Potatoes—Assuming that September first is the correct dividing point between early and late potatoes, the total straight car shipments of early potatoes for California for 1918 were 4,128 as reported by the Bureau of Markets. Other records show that 2,245 cars were rolled from southern California alone as compared with 1,749 cars the year previous. Of this amount Los Angeles County originated 1,857 cars in 1918. Shipments from central California originated largely from the Colma district near San Francisco and the Delta district tributary to Stockton. Many shipping points scattered over the state also contributed to the carlot movement.

More of the crop moved in August than it normally does on account of the lateness of the season but the month of heaviest shipments was July, and the peak was reached during the second week in July, when 638 cars were rolled. The first car was not shipped until after the middle of May and the southern California crop was cleaned up early in August.

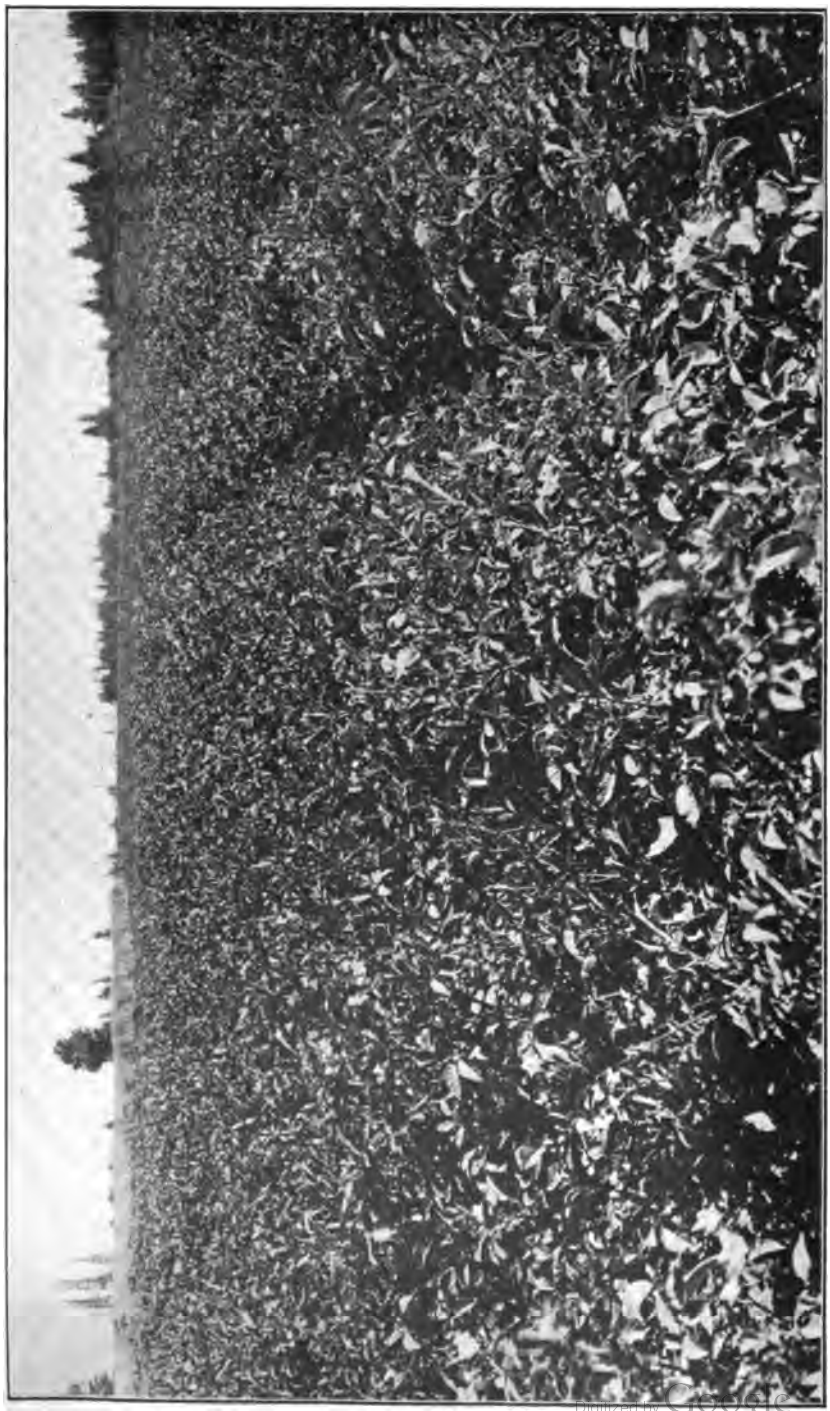

FIG. 92—A LUXURIANT FIELD OF POTATOES GROWN FOR SEED. THE PACIFIC COAST REGION LENDS ITSELF ADMIRABLY TO THE COMMERCIAL PRODUCTION OF POTATOES.

POTATOES.

TABLE XIX: *Acreage and production of potatoes by counties, 1909 and 1918.*

County	1909			1918		
	Acreage	Average yield per acre, bushels	Production, bushels	Acreage	Average yield per acre, bushels	Production, bushels
Alameda	1,655	106.30	175,920	2,500	130	325 000
Alpine	22	133.82	2,944	30	120	3,600
Amador	125	112.43	14,054	150	160	24,000
Butte	171	100.59	17,201	175	130	22,750
Calaveras	147	142.84	20,997	150	150	22,500
Colusa	439	64.67	28,391	400	110	44,000
Contra Costa	12,687	175.51	2,226,695	8,000	150	2,200,000
Del Norte	69	142.03	9,800	300	160	48,000
El Dorado	113	163.83	18,513	200	220	44,000
Fresno	218	109.59	23,891	700	85	59,500
Glenn	24	59.79	1,435	200	115	23,000
Humboldt	1,108	141.19	156,437	400	140	56 000
Imperial	60	55.79	3,347	350	90	31,500
Inyo	326	162.25	52,894	1,000	300	300,000
Kern	339	152.41	51,666	1,200	160	192,000
Kings	194	91.02	17,658	200	140	28,000
Lake	182	119.63	21,773	150	150	22,500
Lassen	259	137.85	35,703	750	150	112,500
Los Angeles	4,140	99.79	413,151	8,000	130	1,040,000
Madera	75	88.83	6,662	300	150	45,000
Marin	435	76.94	33,469	2,500	140	350,000
Mariposa	76	112.33	8,537	400	150	60,000
Mendocino	616	128.09	78,9.9	800	140	112,000
Merced	246	76.75	18,882	300	200	60,000
Modoc	346	128.95	44,614	750	160	120,000
Mono	97	124.68	12,094	100	160	16,000
Monterey	5,393	67.58	364,468	2,000	130	260,000
Napa	530	154.08	81,659	2,000	120	240,000
Nevada	106	120.12	12,733	200	235	47,000
Orange	1,770	71.96	127,367	4,500	140	630,000
Placer	72	103.36	7,442	300	140	42 000
Plumas	100	126.38	12,638	700	160	112,000
Riverside	309	72.46	22,392	1,800	120	216,000
Sacramento	1,406	114.17	160,519	1,300	160	208,0 0
San Benito	205	124.00	25,438	250	130	32,500
San Bernardino	444	97.89	43,364	800	140	112,000
San Diego	374	95.50	35,717	700	120	84,000
San Francisco	87	84.67	7,366			
San Joaquin	21,313	200.79	4,279,395	25,000	155	3,875,000
San Luis Obispo	955	110.24	105,277	350	130	45,5:0
San Mateo	971	113.16	109,879	150	130	19,500
Santa Barbara	1,524	99.43	151,532	2,000	130	260,000
Santa Clara	1,085	97.34	105,617	5,000	150	750,000
Santa Cruz	1,060	119.42	128,977	420	130	54,600
Shasta	243	114.22	27,756	100	120	12,000
Sierra	46	109.04	5,016	400	140	56,000
Siskiyou	655	116.36	76,218	1,200	100	120,000
Solano	311	136.39	42,416	1,000	175	175,000
Sonoma	2,279	70.91	161,597	4,000	130	520,000
Stanislaus	207	84.55	17,502	800	120	96,000
Sutter	218	107.43	23,419	200	100	20,000
Tehama	112	116.50	13,048	200	115	23,000
Trinity	143	143.12	20,467	300	140	42,000
Tulare	677	84.23	57,026	2,500	105	262,500
Tuolumne	114	164.98	18,808	100	160	16,000
Ventura	264	114.11	30,124	100	90	9,000
Yolo	402	113.17	45,493	800	110	88,000
Yuba	124	62.08	7,698	1,000	110	110,000
The state	67,688	145.14	9,824,005	90,175	143	12,899,450

QUINCE.

The quince being rather limited in its uses is not grown on a large scale anywhere in the state, although it does well under a wide range of conditions and brings a good price in small quantities. There are a few commercial plantings to be found here and there. The trees are subject to about the same troubles as the apple and pear, being quite susceptible to blight and codling moth injury.

The delicious qualities of the quince when made into jelly by combining the juice with that of apple or other fruit juices is not yet appreciated by a great many people. "Quince honey" is a product not well known, but one which is deserving of greater popularity. It is made as follows:

> "Pare and core one dozen quinces, carefully removing all specks and chop in meat-grinder or grate; to one pint boiling water add five pounds sugar. Stir over fire until sugar is dissolved. Add quince and cook for 15 to 20 minutes. Turn into glasses. When cold should be about color and consistency of honey."

Like many others of our little grown fruits, too little attention has been paid to the selection of varieties, and a great many different shapes and sizes of this fruit may be found in California. A small orchard of some desirably shaped variety of superior quality would, without doubt, be a good investment.

TREES AT RIGHT ARE BARTLETT ON FRENCH STOCK; ON LEFT, SAME VARIETY ON QUINCE STOCK. ALL ARE FOUR YEARS OLD.

RICE.

The United States Census Bureau does not report any rice grown in California in 1909.

Estimates of the acreage and production of rice made by the Bureau of Crop Estimates in 1910 and the years following are shown in the following table:

	Acreage	Yield per acre, bushels	Production, bushels
1910	100	33.0	3,300
1911	150	40.0	6,000
1912	1,400	50.0	70,000
1913	6,100	48.0	293,000
1914	15,000	53.3	800,000
1915	34,000	66.7	2,268,000
1916	58,000	59.0	3,422,000
1917	83,000	68.0	5,644,000
1918	106,220	66.0	7,011,000

For the past three years only the states of Louisiana, Texas and Arkansas have exceeded California in the production of rice.

The following table showing the acreage and production in states named will be of interest to California growers:

	Acreage			Production		
	1918	1917	1916	1918	1917	1916
Louisiana	580,000	500,000	443,300	17,980,000	15,500,000	20,392,000
Texas	245,000	238,000	235,000	7,840,000	7,140,000	10,575,000
Arkansas	170,000	152,000	125,000	7,310,000	6,232,000	6,312,000
California	106,220	83,000	58,000	7,011,000	5,644,000	3,422,000

Below is shown the estimated acreage, average yield per acre, and production of rice in California by counties for the year 1918:

RICE.

TABLE XX: *Acreage and production of rice by counties, 1909 and 1918.*

County	Acres	Average yield, bushels	Production bushels
Butte	27,000	67.3	1,817,100
Colusa	28,500	71.0	2,023,500
Glenn	30,000	64.5	1,935,000
Kern	500	48.0	24,000
Merced	7,800	50.0	90,000
Stanislaus	1,920	33.5	64,300
Sutter	1,500	80.0	120,000
Yolo	13,500	63.4	855,900
Yuba	1,500	54.0	81,000
The state	106,220	66.0	7,010,800

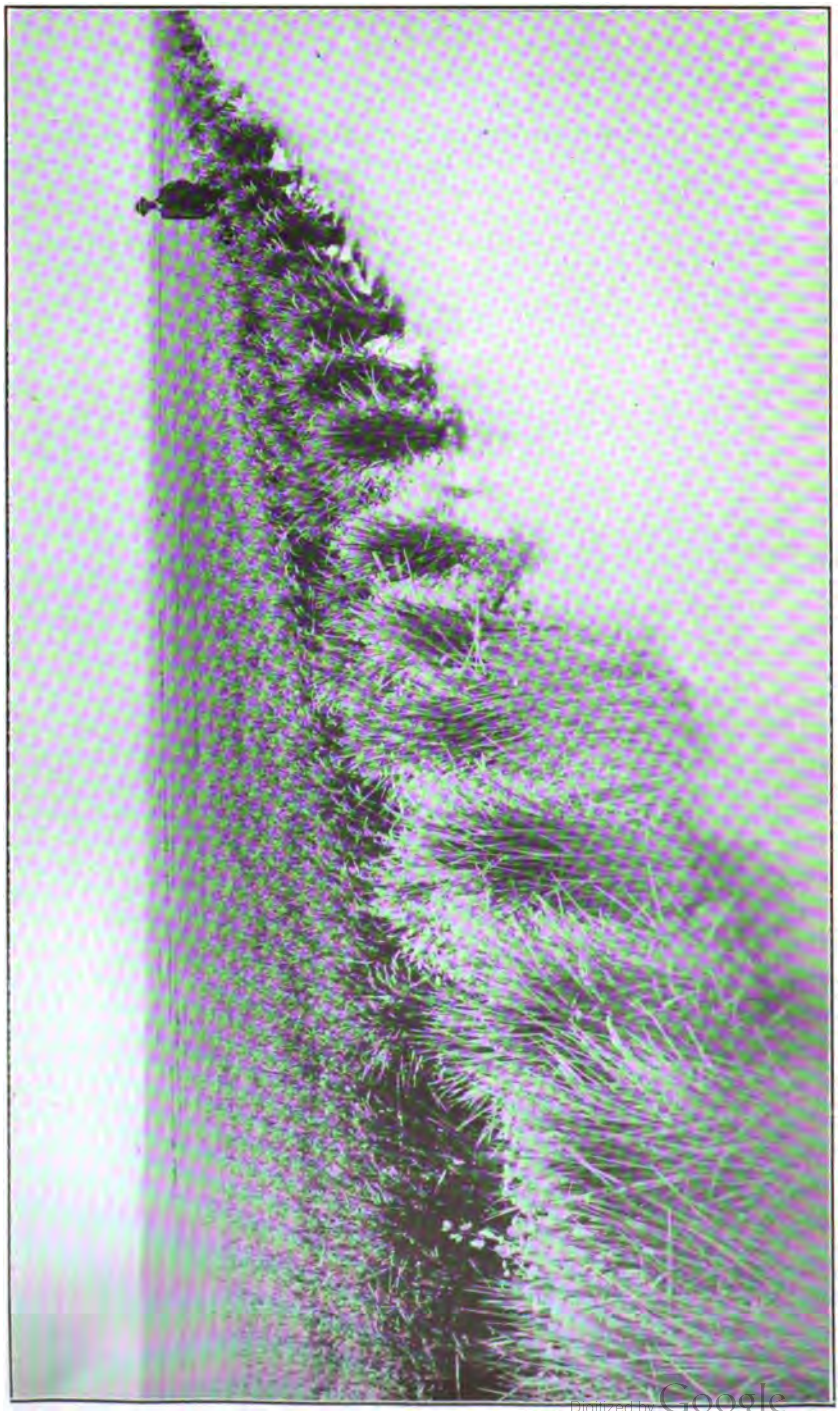

FIG. 93—RICE FIELD IN NORTHERN CALIFORNIA. THIS CROP MUST BE GROWN WITH WATER CONSTANTLY ON THE FIELD.

SORGHUMS.

TABLE XXI: *Acreage and production of sorghums by counties, 1909 and 1918.*

County	1909			1918		
	Acreage	Average yield per acre, bushels	Production, bushels	Acreage	Average yield per acre, bushels	Production, bushels
Butte	409	23.3	9,529	1,000	24.0	24,000
Colusa	2,568	18.6	48,418	1,000	23.0	23,000
Fresno	1,689	22.2	37,506	5,000	24.0	120,000
Glenn	162	30.7	4,972	1,000	18.0	18,000
Imperial	9,789	21.8	213,731	100,000	30.0	3,000,000
Kern	2,813	16.3	45,828	15,000	23.0	345,000
Kings	3,931	24.2	95,010	10,000	25.0	250,000
Los Angeles	106	20.2	2,145	1,000	20.0	20,000
Madera	343	14.4	4,948	500	30.0	15,000
Merced	2,206	20.7	45,770	12,000	20.0	240,000
Orange	189	18.8	3,557	500	17.0	8,500
Riverside	44	13.2	580	6,700	22.0	147,400
Sacramento				1,000	18.0	18,000
San Bernardino	1,216	12.6	15,391	6,900	25.0	172,500
San Diego				2,400	15.0	36,000
San Joaquin	2,968	11.0	32,786	2,000	25.0	50,000
San Luis Obispo				1,000	18.0	18,000
Stanislaus	4,446	18.1	80,343	5,000	20.0	100,000
Sutter	352	22.0	7,750	500	19.0	9,500
Tulare	10,987	25.3	288,382	2,500	24.0	60,000
Yolo	21	33.8	710	1,000	17.0	17,000
Yuba				250	18.0	4,500
The state	44,271	21.2	937,406	176,250	26.6	4,696,400

NOTE—Data on the acreage of grain sorghums is very meager. This crop is grown largely in irrigated districts after the grain crop has been harvested, and to some extent in young orchards and vineyards. So many factors thus enter into the planting that radical changes in acreage may take place yearly, rendering it practically impossible to do more than offer a rough estimate on both acreage and production.

SPINACH.

The first large crop of spinach grown for canning in California, the first important Eastern shipments of California spinach in the fresh state, and the first extensive area of California spinach devoted to seed production were features of the year 1918.

Only a few straight cars of spinach were shipped East in 1918, and they were regarded as an experiment, but they brought such satisfactory returns that larger plantings were made in the following fall for heavier shipments the next year. Much loss occurred in the product grown for canning on account of bunched maturity and inability to handle during the rush period. The seed crop was not altogether satisfactory on account of weather conditions, but was better than some of the later crops.

The possibilities of spinach production in California were demonstrated in 1918 as never before and it has now become established as a commercial crop.

TOMATOES.

While there was a large acreage of tomatoes grown in California in 1918 the commercial output was not correspondingly large. The quantity of shipping stock was particularly light. The total production of canning stock in 1918 as determined by the Bureau of Crop Estimates was 202,533 tons and in addition approximately 12,000 tons were shipped to the markets of the country in the fresh state. A larger percentage of the total crop than usual went to the canners. Shipments of market stock (greens and pinks) were especially light during the fall months when they normally would have been heavy. The carlot shipments from southern California in 1918 for the month of September amounted to only 82 cars while in the same month the year previous they amounted to 279 cars.

There were serious losses in most of the tomato districts of the state from various plant diseases, and there was a heavy loss of maturing stock in the fields of central California following unprecedented September rains. Yields in different districts varied widely, averaging from 3 to 9 tons per acre. Instances of several yields of individual growers of 30 tons per acre were reported, however, yet these large yields were very exceptional.

WATERMELONS.

The total carlot shipments of watermelons rolled from California loading points in 1918 as reported by the Bureau of Markets was 1,680. The production was not particularly heavy, but a good market made it possible to clean up the crop well. The principal growing districts are in the Imperial and San Joaquin valleys. The movement of the crop began the first week in June in the former district. The heaviest weekly shipments were made the week ending August 5. One hundred and eighty-four cars rolled that week. The last shipments were made the second week in October.

WHEAT.

TABLE XXII: *Acreage and production of wheat by counties, 1909 and 1918.*

County	1909			1918		
	Acreage	Average yield per acre, bushels	Production, bushels	Acreage	Average yield per acre, bushels	Production, bushels
Alameda	1,075	20.03	21,535	5,000	14	70,000
Alpine	618	31.50	19,464	200	12	2,400
Amador	293	17.64	5,169	1,000	12	12,000
Butte	20,894	11.76	245,743	16,000	14	224,000
Calaveras	51	8.6	439	500	12	6,000
Colusa	11,168	19.84	221,549	14,000	12	168,000
Contra Costa	2,443	21.83	53,332	4,500	8	36,000
Del Norte						
El Dorado	193	16.59	3,201	300	12	3,600
Fresno	7,829	12.43	97,391	19,000	10	190,000
Glenn	17,541	13.28	232,911	11,000	16	176,000
Humboldt	134	28.13	3,770	300	17	5,100
Imperial	125	20.47	2,559	9,000	26	234,000
Inyo	1,715	29.65	50,858	5,000	28	140,000
Kern	12,924	10.78	139,375	10,000	18	180,000
Kings	8,684	16.35	141,978	36,000	26	936,000
Lake	2,563	18.00	46,131	4,000	18	72,000
Lassen	9,938	15.48	153,863	9,000	13	117,000
Los Angeles	6,760	8.86	59,866	13,000	8	104,000
Madera	39,468	9.39	370,499	9,000	14	126,000
Marin	57	18.50	1,055	700	12	8,400
Mariposa	124	11.27	1,398	500	12	6,000
Mendocino	3,906	15.16	59,195	5,500	18	99,000
Merced	10,399	11.15	115,938	7,000	15	105,000
Modoc	9,362	20.93	195,924	9,000	10	90,000
Mono	167	16.40	2,739			
Monterey	22,924	13.00	298,060	7,000	10	70,000
Napa	4,134	12.26	50,671	3,000	13	39,000
Nevada	95	13.46	1,279	100	12	1,200
Orange	793	13.62	10,797	700	8	5,600
Placer	5,721	10.87	62,167	13,000	12	156,000
Plumas	766	13.46	10,313	1,000	20	20,000
Riverside	11,817	13.49	159,434	14,000	15	210,000
Sacramento	10,704	9.69	103,728	36,000	12	432,000
San Benito	4,451	12.93	57,535	5,000	16	80,000
San Bernardino	100	2.00	200			
San Diego	7,268	11.28	82,012	6,000	14	84,000
San Francisco						
San Joaquin	24,786	12.53	310,587	25,000	18	450,000
San Luis Obispo	33,606	12.75	428,636	36,000	10	360,000
San Mateo	68	21.66	1,473	1,500	13	19,500
Santa Barbara	2,300	12.13	27,892	1,000	17	17,000
Santa Clara	376	27.12	10,198	3,000	20	60,000
Santa Cruz	217	16.72	3,629	100	20	2,000
Shasta	3,783	11.90	45,022	6,000	14	84,000
Sierra	383	16.68	6,389	100	12	1,200
Siskiyou	17,872	12.56	224,512	16,000	15	240,000
Solano	20,924	18.72	391,753	53,000	16	848,000
Sonoma	56	25.80	1,445	1,500	13	19,500
Stanislaus	22,068	11.70	258,121	7,000	11	77,000
Sutter	14,537	12.16	176,750	17,000	16	272,000
Tehama	6,090	13.79	84,009	12,000	17	204,000
Trinity	377	13.99	5,274	200	12	2,400
Tulare	66,567	11.44	761,459	28,000	10	280,000
Tuolumne	277	19.39	5,373	400	13	5,200
Ventura	2,896	23.26	67,366	100	10	1,000
Yolo	13,452	17.64	237,393	13,000	13	169,000
Yuba	10,376	7.15	74,227	10,000	17	170,000
The state	478,217	12.97	6,203,606	506,200	15	7,490,100

VOLUME VIII No. 5

MONTHLY BULLETIN

OF THE

STATE COMMISSION OF HORTICULTURE

Putting the Blastophaga to Work in a Grove of Figs.

SACRAMENTO, CALIFORNIA MAY, 1919

CONTENTS.

PRUNING THE CHERRY.

A five-year-old Bing cherry orchard showing results of pruning. All trees are symmetrical, have a spreading shape admitting light, and are thrifty.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

Acceptance for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917; authorized August 27, 1918.

Vol. VIII. May, 1919. No. 5

California Can Produce Rootstocks!

One of the perplexing problems so closely touching the fruit-growing business of the state, and, indeed, the entire Pacific Slope, partly as an aftermath of the great war, is the threatened deficiency in rootstocks!

To the fruit grower, this question is one of vast importance. It was upon these sturdy, resistant rootstocks imported from northern France and Belgium that he budded his millions of pears, apples, and almonds, for up to this time American horticulturists have utilized these famous rootstocks to the exclusion of native products.

Now we are confronted with two conditions which, although temporarily working to great disadvantage in producing a shortage of imported rootstocks, must, in the end, serve a good purpose through the stimulation of the production of such stocks in the United States: (1) Many of the sections of France and Belgium could not now furnish these rootstocks owing to their own needs and the fact that the departments given over to the growing of rootstocks have suffered devastation, and (2) such importations are now proscribed through the enactment of Federal Quarantine No. 37, effective June 1, 1919, which is intended as an added safeguard against the introduction of noxious plant pests and plant diseases, which have produced such great economic loss to American horticulture and agriculture in the past.

The question is asked every day: "Can I grow such and such a fruit or crop in California?" The answer is: "You can!"

The wealth of varied soil conditions; the climate, usually lacking the extremes of temperature suffered by other parts of the United States and eastern Europe; the

natural barriers afforded by the mountain ranges on the east and the ocean on the west, all contribute to produce ideal conditions for the production of American rootstocks.

It is fortunate, at this time, that steps already have been taken to promote this important phase, which contributes so largely to the interest of our fruit-growing industry.

Opportunity is knocking at the doors of the nurserymen of California. Here can be grown the rootstocks not only for the ever-increasing demands of the state, but for those of the United States. Many nurserymen have been quick to see the possibilities for the future in this direction, as the large plantings will attest, and there is every reason to believe that the near future will furnish the ultimate satisfactory solution and the state of California will contribute rootstocks not only to the state itself, but to the entire country.

G. H. H.

Fruit Growing on the Desert.

Many others, like the writer, were thoroughly impressed, while studying geography in the public school, that the desert is a wide, level, dusty, dreary, uninhabitable expanse of territory. It is now difficult to reconcile these boyhood impressions to the conditions which the writer witnessed in portions of the Mojave desert while on a recent automobile trip. That the most beautiful of wild flowers occur in the desert is a fact that is incompatible with some of the things we have been taught, and that fruits of the finest flavor and keeping qualities can be produced under the arid conditions of the desert is, again, a fact that seems irreconcilable to the teachings of youth. Notwithstanding these early impressions and the idea held by many people that the desert regions where vegetation, if present, is small, uninviting and of little use in nature, there are thousands of acres of true desert land which are being turned over by the plow, and other hundreds of acres which have already been planted to fruit trees on the Mojave desert alone. In some locations, especially near the foothills, it is possible to develop a sufficient water supply for ample irrigation; in other cases, trees are growing under conditions of drought such that it is nothing short of marvelous that they should do so well. Near Victorville and Barstow, in San Bernardino County, and in the Palmdale and Lancaster region of Los Angeles County, apple and pear growing is rapidly assuming a place of importance in our horticultural industry. Despite the fact that in some situations the leaves of these trees are wind-whipped and more or less damaged, and the trees themselves will not remain in an upright position, but always lean from the direction of the prevailing wind, good crops of fruit are harvested. Stranger than all else, this fruit ripens comparatively late and possesses exceptionally fine keeping qualities. For example, Bartlett pears grown under the conditions of the Mojave desert may be found in our markets at Christmas time in a sound and generally satisfactory condition. The shape is somewhat abnormal, but not altogether objectionable, and is a trademark indicating a successful battle with the elements.

With a bountiful supply of irrigation water, good windbreaks and good culture, the desert lands will grow high-grade fruit, and the possible development of the fruit industry on such lands as man has at one time classed as waste can only be appreciated by those who have seen with their own eyes what is already being done.

G. P. W.

High Cost of Spray Material Versus Control of Orchard Pests.

The high cost of products in general has met with no exception in the case of materials used for insecticidal and fungicidal purposes. While we have no proof that high prices of such materials have tended to decrease the efficiency of spraying, there is every reason to believe that such is the case. Those who are most familiar with spraying practices know that there is often too much of a disposition on the part of the orchardist to economize in material and, as a result, his efforts to control a certain insect or disease may be in vain. That the high prices which prevail at present result in a greater tendency to economize in material and a consequent lessening of efficiency, is a reasonable supposition.

In all spraying there is nothing of greater importance than thoroughness of application of the spray material. Insect pests of all kinds, but especially the scales and aphids, breed very rapidly, and the nearer one can come to killing 100 per cent when spraying, the better will the spraying pay. On the other hand, a very large percentage, for example, 80 or 90 per cent of the individuals of a certain pest may be destroyed, while the 10 or 20 per cent remaining will in a few days' time reproduce to such an extent that the value of the spray will not be noticeable. In other words, a desire to save a small amount of spray material to lessen the cost of spraying an orchard may result in almost an entire loss of time, money and labor utilized in making the application. If spray materials are high and the orchardist feels that he can not afford to buy a sufficient quantity to spray the orchard thoroughly, he would do better if he would spray only half the orchard, using a sufficient amount of material per tree to get results, than to spray the entire orchard with only one-half enough material.

Therefore, no matter how high the price of insecticides or fungicides may become, a lesser quantity of dilute spray should not be considered. Instead, there should be some very careful experiments to determine the minimum strengths that may be used successfully.

G. P. W.

PEAR GROWING IN CALIFORNIA.

YOUNG BARTLETT PEAR ORCHARD SHOWING INTERCROP OF BEANS.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VIII. May, 1919. No. 5

THE VENTURA COUNTY BRANCH INSECTARY.

By HARRY S. SMITH, Sacramento, Cal.

The citrus mealybug has been for a number of years a serious pest in parts of Ventura County. While many of the orchards are free from this insect, it has been particularly severe in those localities where it does occur. On account of this fact the various control measures recommended have received particular attention from the horticultural commissioners of this county. These control measures, however,

FIG. 94—Ventura County Branch, State Insectary, Santa Paula. This insectary was built by Ventura County for the propagation of beneficial insects.

as in other localities, have met with only mediocre success, and it remained for the present Commissioner, Mr. A. A. Brock, in co-operation with the State Commission of Horticulture, to give the biological method, or control by the use of natural enemies, a thorough trial, with the result that the citrus mealybug is in complete subjection in those orchards in which this work has been carried on to completion. To Mr. Brock belongs the credit of building the first county branch of the State Insectary, a move which we hope will be followed by other commissioners in counties where the mealybug is a serious pest. Taking hold of the problem in his usual energetic way, he succeeded in convincing his Board of Supervisors of the value of this work to the farms and orchards of his county, with the result that they appropriated $2,400 for the purpose of erecting a building in which to rear beneficial insects. We are convinced that this investment will prove a most profitable one for Ventura County, since Mr. Brock already has been able to produce large numbers of *Cryptolæmus* in his insectary.

FIG. 95—Interior of Ventura County Branch of State Insectary, showing cages used for rearing natural enemies of mealybugs.

SOME WORK OF THE INSECTARY DIVISION IN CONNECTION WITH THE ATTEMPTED INTRODUCTION OF NATURAL ENEMIES OF THE BEET LEAFHOPPER.[1]

By E. J. VOSLER.[2]

Foreign Collector, Insectary Division.

INTRODUCTION.

Before going into an account of the writer's trips to Australia, which were made primarily for the purpose of securing enemies of the beet leafhopper, *Eutettix tenella* Baker, it might be of interest to give a brief summary of the work of this insect in California and elsewhere and the reasons for undertaking this investigation.

For some years it has been known to entomologists that the leafhopper, *Eutettix tenella*, has been associated with the disease known as curly-leaf, which is destructive to the culture of the sugar beet. In 1909 the United States Bureau of Entomology published a bulletin[3] by E. D. Ball on the leafhoppers of the sugar beet, in which a detailed account was given of the curly-leaf disease in the intermountain

[1]This article constitutes a brief report on Mr. Vosler's work in Australia and is published posthumously because we believe it should be recorded in the Monthly Bulletin.—*Harry S. Smith.*

[2]The writer wishes to express his most sincere thanks for the generous assistance of the Australian officials. He wishes to mention in particular, Mr. W. W. Froggatt, entomologist of the New South Wales government, and his assistants, Messrs. Gurney and McCarthy; Mr. C. French, Jr., entomologist of the Victoria Department of Agriculture, and Messrs. Walter Laidlaw, C. Brittlebank, E. E. Pescott and Mr. G. Benner, also of the Biological Branch of the Victoria Department of Agriculture; Mr. Lea of the South Australia Museum; Mr. Quinn, horticulturist for the South Australia Department of Agriculture; and Mr. H. W. Andrew, botanical assistant for the same department; Mr. Henry Tryon and his assistant; Mr. Jarvis of the Entomological Department of the Queensland Department of Agriculture, and the officers of the Oceanic Steamship Company.

[3]Bureau of Entomology, U. S. Dept. Agr. Bull. 66, Part IV.

states and the rôle *Eutettix tenella* plays in the transmission. Ball states in this bulletin that as early as 1897 the sugar beet crop around Lehi, Utah, suffered a serious loss. It was not until 1905, however, that it was noticed, in fields where curly-leaf was prevalent, that large numbers of the beet leafhopper were present, and it was first suspected that this leafhopper might in some way be connected with the diseased condition of the sugar beets. The study of this disease was begun by Ball in 1905 and continued in 1906 and 1907. The results of his work show that the curly-leaf condition of the beets appears soon after the leafhoppers are found in the fields, that the severity of the disease is contingent upon the numbers of this species present, upon the time of their appearance and upon climatic conditions. Investigations continued by Ball, Stahl, Smith and Boncquet have definitely proved that the bite of this particular leafhopper is necessary for the transmission of the curly-leaf disease to healthy beets. Just what the causal organism of curly-leaf is

FIG. 96—Wardian cases used in shipping parasites of leafhoppers from Australia.

has not been determined. Recently Stahl and Carsner[1] have published the information that leaf-hoppers which have never fed on beets affected by curly-top will not produce the disease on healthy beets. Sufficient proof has thus been obtained pointing to *Eutettix tenella* as the guilty party in the inoculation of sugar beets with curly-leaf.

CHARACTERISTICS OF CURLY-LEAF.

In beet leaves first affected with curly-leaf there is a thickening of the smaller veins, the undersides presenting a roughened appearance. The edge of the leaf curls up and finally the whole leaf curls. As the disease advances the smaller veinlets grow still larger, and irregular, knot-like swellings become noticeable. In some cases the beets shrivel and die, in others they partially recover and a new set of leaves develops. The sugar content remains low in all affected beets and consequently the loss is greater than usually is supposed.

[1]Jr. Agr. Res. Vol. XIV, No. 9.

DESCRIPTION OF THE LEAFHOPPER.

The full-grown leafhopper is a small, pale yellowish-green insect about an eighth of an inch in length. The eggs are elongate, slightly curved, tapering at one end and white in color. They are deposited mostly in the stems and the midribs of the beet leaves. The nymphs are whitish with dark markings on the dorsum. There appears to be only one generation a year. The adults appear in the fields in the spring and deposit their eggs in the beets. They will breed in a number of native Chenopodiaceæ besides the sugar beet, including *Atriplex*, Russian thistle, *Sarcobatus*, etc. They have been found on several weeds that are not Chenopodiaceæ. The life-history of this insect in California is now being studied by Severin of the State University and Stahl of the United States Bureau of Entomology.

DISTRIBUTION OF THE BEET LEAFHOPPER.

The leafhopper is generally distributed throughout the southwestern part of the United States. It has always been supposed to be a native of this part of North America. Recently a trip by Boncquet to Argentina revealed the presence of *Eutettix tenella* and the curly-leaf disease in the beet fields of that country, so the origin of the insect remains obscure.

LOSSES FROM CURLY-LEAF.

Losses from the ravages of the curly-leaf disease have been enormous not only in California, but also in the other western states where the sugar beet is grown. Of course, the amount of damage will vary from year to year. In the year 1914 the loss reported by one sugar company alone in California and in a single small valley was given as $1,000,000. The total loss from all beet-growing sections will go far into the millions. In some parts of California the disease is so bad that the growing of sugar beets has been practically discontinued, and sugar factories abandoned.

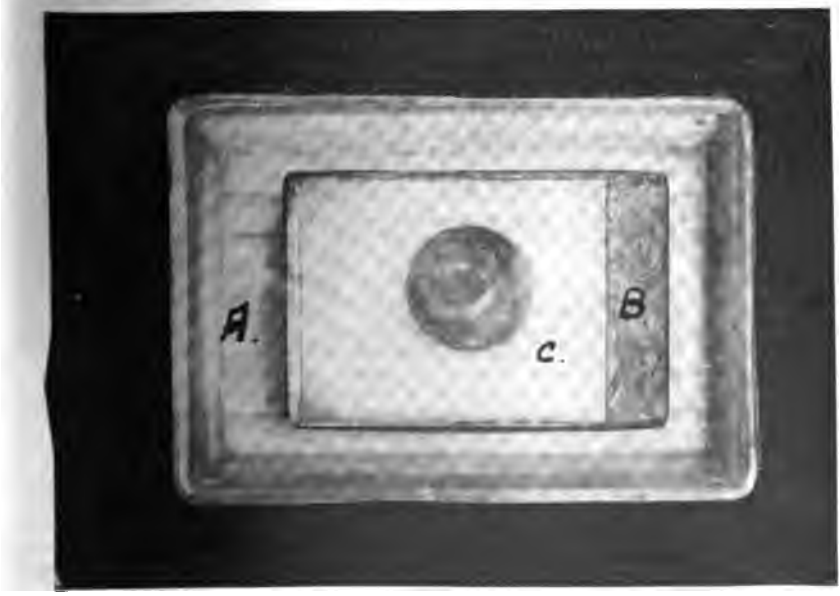

FIG. 97—Plaster of paris incubating chamber used in rearing egg parasites. A—Glass tray filled with water; B—Plaster of paris block; C—Glass cover to block.

CONTROL MEASURES.

Experimental work in the control of the beet leafhopper has been carried on by the United States Bureau of Entomology, the Utah Experiment Station, the University of California and the various sugar companies, but no successful measure has been developed whereby the leafhopper can be checked. The early planting of sugar beets so that the beets are well started before the leafhoppers appear in the fields

gives the best results. Spraying the beets with various washes such as blackleaf-40, kerosene emulsion and soap solutions has been tried. Difficulty in destroying the adults with a spray and the fact that the undersides of the beet leaves can not be thoroughly sprayed make this method of control of doubtful value. A variety of resistant beets has not yet been developed. The destruction of native weeds on which the leafhopper may breed surrounding beet fields is practically impossible in many cases.

BIOLOGICAL CONTROL.

Because of our inability to control the beet leafhopper by artificial means, the possibility of controlling it by the introduction of natural enemies was given the attention of the State Commissioner of Horticulture. Later in 1916, through the co-operation of the Spreckels Sugar Company, the State Commissioner arranged to send a collector to foreign countries to investigate parasites of leafhoppers with a view to introducing them in the beet fields of this state as an aid in the control of this pest. It was thought advisable to explore Australia first, as many species of leafhoppers are present in that country which are known, through the researches of Koebele and Perkins, to be attacked by numbers of natural enemies. Also Australia presents in its flora many species of Chenopodiaceæ, to which family the sugar beet also belongs. The writer was selected to conduct the investigations, and left San Francisco in January, 1917, for Sydney, Australia, arriving there February 22.

The introduction of a Dryinid parasite of a leafhopper abundant on *Eragrostis villosa*, in eastern New South Wales, occupied much of the time of the writer during his first trip. A number of Wardian cases filled with parasitized leafhoppers of this species were sent on several steamers to the Insectary Division at Sacramento, but only one female Dryinid came through in a living condition. This was placed in a cage with beet leafhoppers and was observed to oviposit in them, but unfortunately no parasites were reared. The parasitism by this Dryinid on the above leafhopper in New South Wales was approximately 7 per cent. In Victoria investigation of saltbushes for leafhoppers was started, and near Sunshine, Victoria, the writer found a small leafhopper, abundant on a low-growing saltbush, *Atriplex muelleri*. This leafhopper was parasitized to the extent of 85 to 90 per cent by two egg-parasites, *Ptergogramma acuminata* and a Mymarid. Stems of the Atriplex containing the parasite eggs of this insect were sent in cold storage on the Oceanic steamers to California, and from these a number of egg-parasites of both species were obtained. These were placed on the eggs of *Eutettix tenella* and were seen to oviposit. As *Ptergogramma acuminata* attacks several species of Jassids, the chances for its breeding successfully on the beet leafhopper were thought to be good. Winter stopped the work of collecting the egg-parasites in Australia, and the writer left for home on June 15 with the intention of returning on the approach of summer to continue the shipment of egg-parasites, provided additional funds were secured for the carrying on of the work.

The increasing demand for sugar made the continuance of any work which might increase the yield of sugar beets doubly advisable, and an appropriation was obtained from the State Board of Control sufficient to insure the furtherance of the project. During the interval before the return of the writer to Australia much time was spent in rearing large numbers of the beet leafhopper. The greenhouse at Fort Sutter was placed at the disposal of the Insectary by the Superintendent of Capitol Buildings and Grounds, and the leafhoppers were soon breeding in numbers sufficient to insure a supply of eggs upon which the Australian parasites could be placed upon their arrival.

SECOND TRIP TO AUSTRALIA.

The writer left San Francisco January 1, 1918, arriving in Honolulu on January 7. Several hours' time at this port permitted a visit to the Hawaiian Sugar Planters' Experiment Station. Some time was spent in looking over the collection of leafhoppers made in Australia by Messrs. Koebele and Perkins several years ago and also the parasites of leafhoppers taken by them on the same trip. Much valuable information concerning the handling and shipping of parasites was obtained from this station, where considerable experience has been had in the importation of parasitic insects from foreign countries to feed on the insects destructive to the sugar cane. The writer also visited the office of the United States Bureau of Entomology and the Board of Agriculture and Forestry.

After Honolulu, the island of Tutuila, Samoa, was visited. As this island is in the tropics, nothing in the way of collecting leafhopper parasites was attempted, since

it is thought that tropical parasites would be unable to withstand our California winters. Several hours' search for the larvæ of the Mediterranean fruit fly in avocadoes, bananas, oranges, breadfruit and papayas, at the request of the Quarantine Division, resulted in finding no sign of infestation by that pest. A species of mealybug closely resembling the citrus mealybug, *Pseudococcus citri*, was found in small numbers on crotons and the seedling citrus trees near the naval station. Ants were attending them in such numbers that their natural enemies had little chance to attack them.

The port of Sydney, Australia, was reached on January 22. Being somewhat acquainted with Australia from the previous trip, little time was spent in New South Wales excepting to call on the entomologist of the New South Wales Department of Agriculture, Mr. W. W. Froggatt, and his assistants, who had given me much aid during the previous expedition, and to collect a small shipment of beneficial insects to go out on the returning steamer.

FIG. 98—Cage used for rearing beet leafhopper.

This shipment consisted of several boxes of parasitized golden mealybugs, *Pseudococcus aurilanatus*, a pest of Norfolk Island pines in southern California, and a box of twigs infested with the black scale, *Saissetia oleæ*, on which two species of internal parasites were breeding.

After the departure of the steamer, the writer left for Melbourne, where he made his headquarters for the remainder of his stay in Australia. From this point shipments of parasitized material were made every three weeks to connect with the Oceanic steamers plying between San Francisco and Sydney.

An examination of the saltbushes in the state of Victoria, South Australia, and in parts of New South Wales was made for leafhoppers and their parasites. Several species of leafhoppers were found on these saltbushes, and, besides, some thirty species of Jassids were collected on grasses in Victoria, New South Wales and Queensland, but are still undetermined.

By far the majority of the saltbushes were uninfested with leafhoppers. In all the writer's collections in Australia the only parasites which gave promise of being of value in checking the beet leafhopper were the egg-parasites, *Ptergogramma acuminata* and the Mymarid. Consequently his main attention was given to the collection of these parasites in large numbers so that a fair trial could be given them in the laboratories of the Insectary at Sacramento. As previously stated, shipments of the stems of the Atriplex containing the parasitized eggs were forwarded regularly to California on board the Oceanic steamers. Intervals between steamers not occupied in collecting these egg-parasites were employed in searching for additional saltbushes and for parasites of some of our citrus-feeding insects.

INFESTATION OF ATRIPLEX MUELLERI.

The saltbush, *Atriplex muelleri*, was badly infested with a leafhopper in the vicinity of Sunshine, a small town near Melbourne. Nearer Melbourne, where the saltbush was growing in more profusion, the leafhoppers and their parasites were quite scarce. The parasitism at Sunshine by the two egg-parasites, *Ptergogramma acuminata* and the Mymarid, was close to 90 per cent. A careful examination of hundreds of nymphs and adults of this leafhopper showed no signs of parasitism.

Two hundred miles north of Melbourne, on the Murray River, I also found the same saltbush infested by this leafhopper, but the percentage of parasitism by the same egg-parasites was much lower.

METHOD OF PACKING.

Two days prior to sailing of the steamers the stems of the Atriplex were collected and placed in wooden boxes, each having a cubic content of about two feet. Boxes of this size were chosen because of their lightness and consequent ease of handling and also because of the liability of the stems to mold in the center if packed in larger boxes. The boxes were wrapped with two or three thicknesses of light muslin and the seams pasted down to prevent the exit of any insects during the voyage. From

FIG. 99—Cages used for rearing beet leafhopper at Fort Sutter greenhouse.

Melbourne the cases were sent to Sydney by passenger train and placed immediately on board in the coolroom of the steamer at a temperature of 45° F. A letter to Wells Fargo & Company, at San Francisco, enclosing the bill of lading, was dispatched on the same steamer. An official of Wells Fargo & Company met the steamer at San Francisco and sent the shipment on the way to Sacramento, where it was opened in the insect-proof rooms of the State Insectary.

It was found as a rule that the stems of the saltbush came through in good condition. The egg-parasites were still in the larval and pupal stages, and the three weeks in the coolroom of the steamer apparently did not affect their vitality to an appreciable extent.

The most difficult part of the introduction of the delicate parasites was to find some means of rearing the adult insects before the stems dried up and crushed the eggs of the leafhopper in which the parasites were breeding. Various methods were tried, such as placing the ends of the stems in water, in plaster of paris blocks under glass and by dissecting out the eggs which were kept at an even temperature in an incubator, electrically controlled. Only a few adults were obtained by these means. After further experimentation a plaster of paris block, about eight inches long, six inches wide and two inches deep, was cast. Through the center of this block a two-inch hole was left, over which about halfway between the top and bottom a piece of closely-woven muslin was stretched. The eggs of the leafhopper containing the parasites were dissected from the stems and placed in the plaster of paris block on the muslin. The block was placed in a tray of water. A small piece of glass was used to cover the top of the block and the plaster of paris absorbed sufficient water to keep the eggs moist until the parasites emerged. A little difficulty was experienced because of the excessive moisture which would collect around the eggs and drown the parasites as they emerged. This was obviated by cutting an opening in the glass on the top of the block and covering it with muslin and by filling with paraffin the pores in the muslin on which the eggs were placed. The parasites as they emerged were removed from this incubation chamber to cages in the Fort Sutter greenhouse containing beets heavily infested with the eggs of the beet leafhopper.

Since each shipment of the parasite material was too large to permit of the dissection of the parasitized eggs immediately after its arrival at the insectary most of the boxes were placed in cold storage until needed. This plan worked very well. It is interesting to note how long material of this kind can be held in cold storage. The last shipment made from Australia was collected on May 11, near Melbourne. It was placed in the coolroom on board the steamer on May 14, at Sydney. It arrived in San Francisco on June 3, and in Sacramento June 4. It was placed in cold storage again on June 4 and the last box removed from the coolroom on July 6. From eggs dissected from this latter shipment the last *Ptergogramma* was reared on July 13, or nearly two months from the time of collection.

As stated above, the delicate parasites were immediately removed from the incubation chambers after emergence and placed in the cages at Fort Sutter, containing an abundance of the eggs of the beet leafhopper. The movements of these parasites were carefully watched, but they showed no desire to oviposit in the eggs of the leafhopper. Dissection of hundreds of eggs of the beet leafhopper from the cages in which the parasites were liberated revealed no evidence of parasitism, and no parasites developed.

The two species were reared in sufficient numbers to give them a fair trial, so we must conclude that they find *Eutettix tenella* an unsuitable host.

CULTURE OF THE SUGAR BEET IN AUSTRALIA.

The culture of the sugar beet is only in the experimental stage in Australia. A small factory run by the Victorian government for the production of beet sugar is located at Maffra, Victoria. The factory just now seems to be in a fair way to demonstrate the production of sugar on a paying basis. This is the only factory for the production of beet sugar in Australia. The capacity is about 400 tons. It will run through about 40,000 tons of beets during the season. In Queensland the Colonial Sugar Refining Company is engaged in the large scale production of cane sugar, and it is with sugar cane that the sugar beet must compete in Australia.

PARASITES OF CITRUS INSECTS.

At odd times the writer, in his searches for parasites of the beet leafhopper, found an opportunity to investigate some of the insects injurious to citrus culture in Australia. Where those insects were identical or closely related to those that are attacking our citrus in California a study was made of their parasites with a view to introducing them in our own groves.

PARASITES OF THE BLACK SCALE.

FIG. 100—*Thalpochares coccíphaga*: Adult, enlarged.

The black scale (*Saissetia oleæ*) is not considered to be a pest of prime importance on citrus trees in Australia. Whether this is due to the natural enemies of the insect established in that country the writer does not know, but various ornamentals such as *Pittosporum*, oleander and elm were at times heavily infested in the botanic gardens at Adelaide and Melbourne. In the citrus groves visited by the writer only an occasional tree was seen to be infested to any extent. On these trees the predacious moth, *Thalpochares coccíphaga*, the internal parasites, *Coccophagus* sp., and *Aphycus lounsburyii*, the egg-parasite, *Scutellista cyanea*, and various ladybirds were found in abundance.

The two internal parasites, *Aphycus lounsburyii* and *Coccophagus* sp., were collected at Parramatta and Gosford, both in New South Wales, and were received by the Insectary at Sacramento in living condition. As climatic conditions here are similar to those where these parasites were collected, there should be no difficulty in getting them established; particularly *Aphycus*, which seems to be the more promising.

FIG. 101. *Thalpochares coccíphaga*: Egg, greatly enlarged.

The Insectary force is now engaged in rearing these parasites in sufficient numbers to permit the introduction of them in California orchards.

One of the most important enemies of the black scale in Australia is the predacious moth, *Thalpochares coccíphaga*. The larva of this moth feeds on all stages of the black scale, but seems to prefer the eggs. It is a case bearer, making a case of the remains of the host, under which it moves along the twigs in search of additional prey. Fig. 103 shows the case of the larva. As it breeds under conditions similar to California, we can see no reason why it should not do well here. It is heavily parasited in Australia. A number of full-grown larvæ of *Thalpochares* were collected at Parramatta, New South Wales, just prior to the writer's departure from Australia, and placed in cold storage on board the ship. From these, seventeen moths were reared at the Insectary. They were confined in large test tubes and fed with honey. Eggs were first deposited on July 16. On July 24 the first larvæ emerged. As soon as possible after emergence the larvæ were placed on citrus cuttings heavily infested with black scale, egg-stage. The cuttings were inserted in potato tubers to prevent their drying out too rapidly. As soon as the larvæ ate the eggs from one lot of cuttings they were transferred to another until they reached maturity, when they were removed to a vial to await emergence as adults. Other methods of rearing were to place the larvæ on oleanders infested with black scale and in vials filled with black scale eggs. All were successful. The first adult of the new generation emerged on September 9, a little over three months after their arrival. The new generation gives promise of a large increase in numbers, and we hope that two or three generations

FIG. 102—*Thalpochares coccíphaga*: Full-grown larva, enlarged.

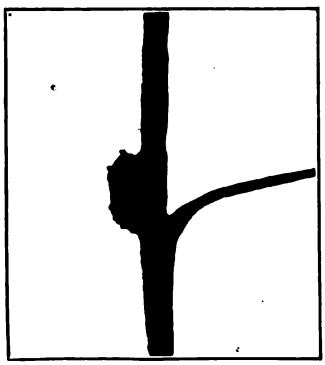

FIG. 103—*Thalpochares coccíphaga*: Larva case on oleander cutting. Natural size.

more in the laboratory will be sufficient to enable us to introduce them in the groves. The *Thalpochares* is the most promising of any of the material brought from Australia.[1]

PARASITES OF MEALYBUGS.

No specimens of the citrus mealybug, *Pseudococcus citri*, were taken during the writer's visits in the citrus orchards of Australia. A species closely resembling *citri* was found infesting a broad-leaved ornamental in the Botanic Gardens at Brisbane, Queensland. From this mealybug the Sicilian mealybug parasite, *Paraleptomastix abnormis* was reared. This parasite is the one which the Insectary Division collected in Italy some years ago and which the Insectary has successfully colonized in the citrus orchards of southern California. This parasite was undoubtedly introduced from Italy into Australia through the importation of plant material infested with mealybugs parasitized by this little insect.

Only two other species of mealybugs were taken on citrus trees, *Pseudococcus longispinus* and *Pseudococcus* sp., the last being larger than any of our citrus-infesting species. None of these three mealybugs are considered to be at all destructive; in fact, in the Epping and Gosford districts of New South Wales a two days inspection of the orchards revealed only two groves to be infested. Most of the young mealybugs in these groves were parasitized. Just prior to the sailing of the steamer the writer spent a day collecting parasitized mealybugs. Approximately one hundred specimens were taken. From these, two species of primary parasites, *Leptomastix* sp. and *Anagyrus* sp., were brought to the Insectary in living condition and liberated on the citrus mealybug, *Pseudococcus citri*, the citrophilus mealybug, *Pseudococcus gahani*, and *Pseudococcus maritimus*. Although *Leptomastix* sp. was seen to oviposit in the citrus mealybug, none was bred from it. A large *Leptomastix* bred from a shipment from Victoria was seen to oviposit in the citrophilus mealybug, but we did not succeed in rearing any parasites from the material.

The golden mealybug, *Pseudococcus aurilanatus*, is becoming an important enemy of the Norfolk Island pines in southern California. As Australia is the home of these trees, the writer was instructed to locate any natural enemies of this pest. At Manly, New South Wales, examination of the *Araucarias* showed that the principal factor in the control of this mealybug was the ladybird, *Cryptolæmus montrouzieri*, which is already of considerable assistance in controlling our California mealybugs. Internal parasites were also in evidence. Material collected at Manly and placed in the breeding cages at the Insectary produced the internal parasites, *Pachyneuron* sp., a small Encyrtid, and *Tetracnemus* sp. These were released upon the golden mealybug. It is too early to tell just what the results will be from this importation. The *Pachyneuron* was also released on *Pseudococcus maritimus* and oviposited readily in this species, but did not develop. From *Pseudococcus acaciæ*, infesting Acacia near Melbourne, *Thalpochares* sp., a predacious moth closely resembling the predacious moth of the black scale, was reared in some numbers. The moth laid eggs in the rearing cages at the Insectary, and the larvæ were placed on the egg masses of *Pseudococcus citri*, but it was found that this mealybug was not a suitable host for the moth. From material containing *Pseudococcus albizziæ* collected near Melbourne a small Encyrtid was reared at the Insectary, which was placed in a cage with our Californian mealybugs, in the hope that it might find them a suitable host. No parasites have yet emerged from this cage. A ladybird, *Rhizobius plebius*, collected in Victoria feeding on *P. acaciæ*, was also introduced as a mealybug destroyer, but we were unsuccessful in rearing it.

Several specimens of *Midas pygmæus* were also reared from this material. The Midas is a small black ladybird with red blotches on the elytra. A colony of this ladybird was collected on the first trip to Australia and brought in living condition to the Insectary. It breeds readily on the citrus mealybug, and it is believed that it will be a promising addition to our imported enemies of mealybugs.

[1]The usefulness of this predator is limited by the fact that it thrives only where the black scale is very abundant on the twigs. H. S. S.

WHAT HINDERS DRIED FRUIT SALES.

By E. RALPH DE ONG, Berkeley, Cal.

The following letter is typical of the complaints occasionally received at the University of California in regard to California dried fruits:

July 30, 1918.

"To the Professor of Entomology, University of California,
Berkeley, Cal.

DEAR SIR: In the early part of May we received a shipment of prunes and a second shipment in the early part of June. Both shipments were stored in a cellar that had a normal temperature of approximately 60°. Upon inspection the latter part of July, approximately 30 days after receipt of the last shipment, both shipments were found to have become wormy. * * * Inasmuch as the prunes were packed in 50-pound wooden boxes, surrounded and covered with paraffine paper before the cover was nailed on and had been in storage as above indicated, and the further fact that the evidence of the wormy condition would be progressive in its development, would it be safe to assume that the prunes were infested with the worm or the egg producing it at the time of packing?"

This is not a new story, certain fruit dealers in this state catering to the business of reprocessing goods which have been damaged by insects. Our modern packing houses are built with a general idea of preparing finished products in such a manner as to be free from insects and mold. The technician who installed the equipment

FIG. 104—Raisins attacked by the larvæ of *Plodia interpunctella*.

of the house planned on using a bath of boiling water as a sterilizing agency, basing this practice on the fact that exposure to a temperature of 180° F. for two or three minutes would kill all insects present. If fruit so treated is then sealed in a tight pasteboard carton no other insects will have access to it and it will go to the consumer in good condition. But if the water bath is heated to 150° F. instead of 212°, or the carton is made tight except at one point, of what value is either?

And if moths and beetles, which have been allowed to breed freely in waste material around the plant, are given access to the new stock of dried fruit or to the processed material just before it is packed, is there any wonder that an occasional shipment is returned as being unfit for human consumption? And if the damaged packages bear a brand which has been popularized at a heavy cost, that advertising has been worse than spent in vain. The memory of that brand has been intensified—and the condition of the package.

The infestation referred to in the letter was apparently the work of the Indian meal moth, *Plodia interpunctella*, which feeds generally on dried fruit. This insect develops from the egg to the mature insect in five or six weeks at a temperature of 70° or more, and in six to eight weeks at temperatures below 70° F. In California we have from four to six generations a year. Under the circumstances mentioned, with a temperature of 60°, it is plain that the presence of adult insects within thirty days after receiving the shipment would be ample proof that the stock was infested when received. The eggs probably were deposited on the fruit after processing or the larvæ may have gained access through cracks to the interior of the box after it was packed.

Insect infestation of dried fruit may begin in the dry yard, the warehouse, the packing house, the grocery store, or the consumer's kitchen. To overcome this we have but two alternatives, either the protection of the fruit against egg laying from the time it goes into the dry yard until it is ready to be eaten, or the fumigation or sterilization by heat after infestation has begun. Of the two methods, penetration is the ideal. Infestation means deterioration or complete loss. Fumigation or sterilization, no matter how successful, can only check the damage, but does not repair it.

FIG. 105—The sawtoothed grain beetle (*Silvanus surinamensis*). Found commonly in raisins.

The heaviest infestation of dried fruit usually comes in one of three cases: fruit which is imperfectly cured at storage time, stocks held for a year or more, and in "processed" fruit just before or soon after packing.

The new crop should be dried carefully before storing in the warehouse. If the fruit is watery it may sour or mold and become acid enough to attract the pomace flies. These feed only on soft, fermenting stock. Dried fruit which contains a small amount of moisture is unattractive to insects, but the moisture content may increase through the rainy season so that insects begin breeding in the spring. Then with the coming of warm weather they increase by the hundreds and thousands, and if nothing is done to check them serious loss results before fall. And here is where the danger of speculation comes in. The use of hot dips in processing dried fruits not only increases the attractiveness of the stock to the human mind, but also to insects, for such treatments raise the moisture content to the point where insects can and will breed in the material fully. It is of the utmost importance, then, to protect newly-processed fruit from insects while it is drying and until it is sealed in a tight package. A wooden box, with no lining

except a sheet of paper laid loosely in it, is no protection against insects, no matter how well nailed the box may be.

PREVENTIVE MEASURES.

The packing house and storage rooms require thorough cleaning at least once a year, preferably just prior to receiving the new crop. Every part of the building where fruit has been handled should be cleaned and all bits of dried fruit or broken packages disposed of. Holdover stocks which are infested with insects should be sterilized or stored in a separate room from that where the new crop is received.

FIG. 106—Larva of sawtoothed grain beetle (*Silvanus surinamensis*).

If dependence is placed upon the hot processing liquid for sterilization purposes, it is necessary to keep this bath at or near the boiling point and to allow the fruit to remain in the liquid long enough to be heated through. Fruit which is of a delicate nature, such as seedless raisins and peaches, deteriorates if subjected to a very hot bath. For such material dry heat may be substituted for the bath. A few minutes exposure at a temperature of 180° F. is sufficient to kill all insects present, or a lower temperature may be used and a longer exposure given. In all treatments with heat, great care should be taken to insure not only a sufficiently high temperature, but also a long enough exposure to allow the maximum temperature to be reached in all parts of the treated material. Otherwise a false security has been

FIG. 107—Work of the moth (*Plodia interpunctella*) on dried apples. This photograph was taken while Mr. Sweet and the author were co-operating in the study of the life history of insects attacking dried fruit. (After Sweet).

created which may be worse than if no control efforts had been taken. Empty cartons which have been stored a short time in the factory may harbor live insects and hence should be placed in a temperature of 150° to 180° F. until they are heated through just prior to using them.

After sterilizing, the fruit should go direct to the packing room and should not be exposed at any time for beetles or moths to deposit eggs upon it. The packing room may be screened with No. 20 wire cloth and should be so constructed that fumigation is possible, if necessary. Screening alone will not exclude all the insects and mites which attack dried fruit, but will prevent the entrance of the larger moths, which cause the greatest loss. Containers for sterilized fruit should be tightly sealed with gummed paper or cloth. The cracks around the sides and tops of wooden boxes are usually open enough to allow the smaller beetles themselves to enter or at least the newly-hatched larvæ of any of the common moths. The only way to prevent this is to have the small carton or the pasteboard box in which they are packed sealed absolutely tight at every point.

SUMMARY.

The best preventives of insect infestation are:

A packing house free from all insect-breeding waste.
New stocks well dried before receiving.
Prompt turnover of all stocks by the end of the winter or early spring.
Fumigation or sterilization with heat, early in the spring, of all stocks, which it is necessary to carry through part of the summer.
Great care in the operation of all sterilizing, fumigating or protective operations to secure the maximum benefit from same.
Preventing the access of all insects to fruit after it has been processed, either while drying, being packed, or after it is in the shipping case.

THE GIRASOLE OR JERUSALEM ARTICHOKE.

By T. D. A. COCKERELL, Boulder, Colo.

The Girasole is a native American plant, used by the Indians before their country was discovered by white men. It was taken to Europe very early in the seventeenth century, and has been in cultivation there ever since. It has, in fact, received much more attention in Europe than in this country. Botanically speaking, it is *Helianthus tuberosus*, one of the sunflowers, producing tall, erect stems and an abundance of foliage, with tubers underground.

FIG. 108—*Helianthus tuberosus* var. *albus*, at Boulder; *fusiformis* at extreme left of illustration.

The foliage can be used as food for animals, and apparently should be at least as valuable as that of the annual sunflower, the use of which has been frequently advocated of late. Years ago, the Agricultural High School in Berlin reported feeding the dried leaves and stalks to sheep and cows. It was considered that the food value was about equal to that of meadow hay, but it was found best to use the material as part of a mixed diet. Last year, Mr. W. A. Groom of Boulder, Colo., cured a quantity of the girasole tops in a silo, but found that the cattle did not care for the plant prepared in this way; he thought it had become bitter, and was certainly distasteful. I regret that it has not been possible to make more extensive experiments along this line; it is very likely that differences in the time of cutting and in the manner of curing will affect the result, and the reactions of the animals may change if they become accustomed to the food, or it is used in a mixture with other things. It is also uncertain whether the fresh foliage can be used with success. I supplied Mr. F. S. Leuthi of Boulder with some of the fresh tops, which he offered to his dairy cows, but they did not care for them. At the present time, then, we

FIG. 109—*Helianthus tuberosus* var. *fusiformis* at Boulder.

can only state that the yield in tops is enormous, and should apparently be available as fodder; but we are still uncertain concerning the actual practicability and manner of utilizing the above-ground parts of the plant.

With the tubers the case is entirely different. In France the tubers have long been valued, and an enthusiastic report on the subject summarized from the French journal *La Nature* may be found in *Scientific American Supplement*, July 6, 1918, p. 16. In *Scribner's Magazine* for December, 1918, there is an article by Graham Lusk on the food raised in France in 1915. It appears that during that year of war, with practically all her able men at the front or otherwise engaged in military work, France raised more than enough to feed her whole population. The food thus obtained is estimated in terms of energy (calories) necessary to support forty million people one day. Thus, on this basis, the wheat represents 168 days, the meat 40 days, the milk 42 days, the potatoes 60 days. Now, in this table, the girasole tubers are equivalent to 8 days, exactly the same as all the dry vegetables (peas and beans), and eight times as much as the fresh green vegetables. Further testimony concerning the value of the plant in France may be found in an article by Dr. L. O. Howard of the United States Department of Agriculture, published in *Science* of April 5, 1918, p. 344.

The tubers are valuable as food for men and animals, and can also be used for making alcohol. From the cultural standpoint they have several advantages:

(1) The yield is enormous, at least in the case of the best varieties. In our experiments at Boulder, Colorado, in 1918, we have tested a number of varieties. The most prolific is the white-tubered form (variety *albus*), obtained from Sutton and Sons of England. The same variety was earlier obtained from Dreer of Philadelphia, but in our experience the Sutton strain has given heavier yields. A discussion of the botanical characters and history of this plant will be found in *American Naturalist*, 1919, p. 189. In March, 1919, we dug ten hills of Sutton's white, planted 30 inches apart in the rows, and the rows 18 inches apart. The result corresponded to a yield of 39.78 tons to the acre. The greatest yield from any single hill—an outside one next to the ditch—was 18½ pounds. This was in very good bottom land, but without fertilizer or cultivation.

FIG. 110—*Helianthus tuberosus*, new variety *multituberculatus*, a mutation from Sutton's White, obtained at Boulder, Colo., crop of 1918. Actual length of tuber, 6 inches.

(2) The tubers mature in the fall, and remain in the soil during the winter, unaffected by frost. They can thus be used as fresh feed during the winter months, or can be harvested in the spring. Once harvested, they can be kept in hills in the same manner as turnips; but exposed to the air, they soon lose their moisture and shrivel, eventually becoming hard and dry.

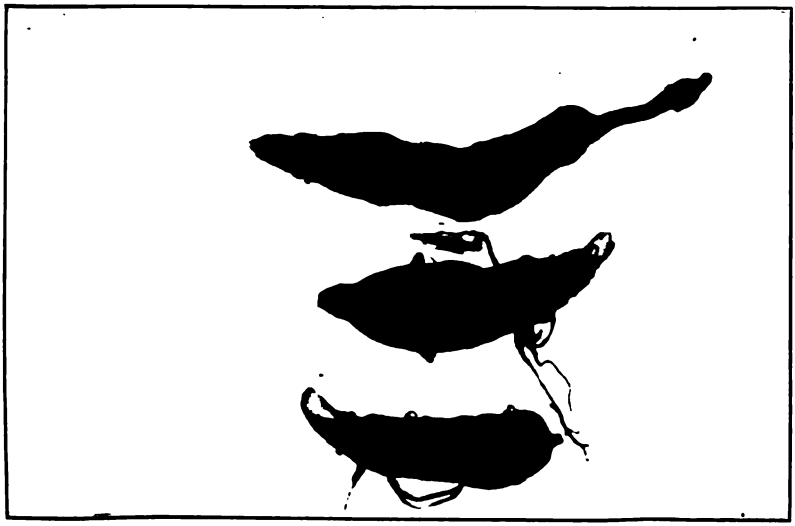

FIG. 111—*Helianthus nebrascensis*: Wild form from Red Cloud, Neb.

(3) The plants form a sort of miniature forest, with dense shade, in which weeds can not live. In our experience, the only successful weed has been the morning-glory (*Ipomœa*), which climbs the stalks and flowers cheerfully at the top.

(4) We have found no serious pests or diseases, and this seems to be the general experience elsewhere. Cutworms (probably *Euxoa agrestis*) destroyed a number of the seedlings at Boulder in May, 1918; but all, or nearly all, came up again from other eyes, and the stand was not visibly affected. However, they are not everywhere immune from attack. Mr. H. Walton Clark writes that at Fairport, Iowa, the girasole has not been a success, on account of two serious enemies. One is the pocket gopher, and the other a root louse (aphid). Concerning the root-aphis, see also *Experiment Station Record*, Vol. XXIII, p. 558. Mr. Clark has sent me tubers from Fairport, infested by mealybugs, *Pseudococcus trifolii* (Forbes).[1]

In discussions with farmers, one often hears the objection that the plant is liable to become a weed. This is especially true of the older, less improved sorts, which have the tubers at the ends of long rhizomes. These plants scatter their relatively small tubers through the soil, and in digging them it is next to impossible to avoid

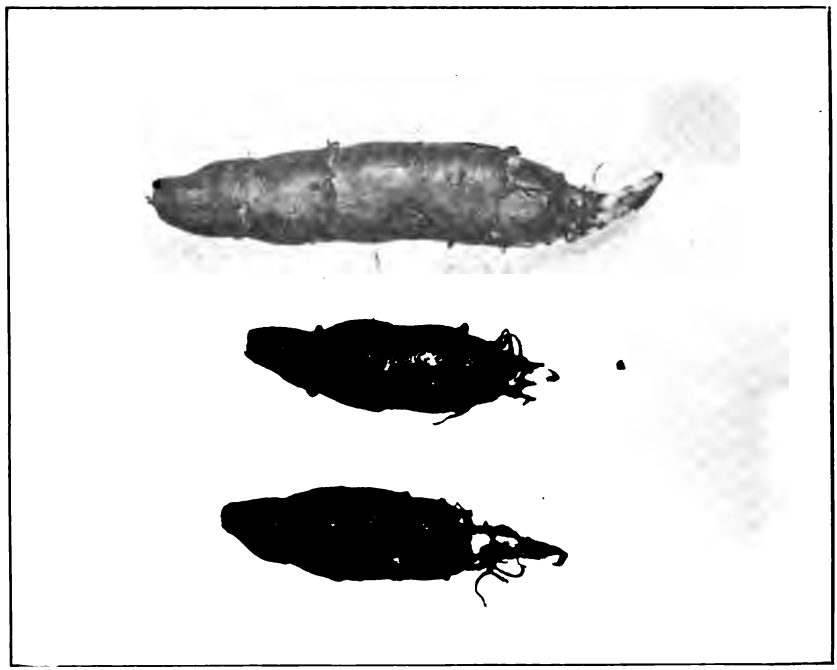

FIG. 112—*Helianthus tuberosus* var. *purpurellus* (Childs' Pink Hellanti).

leaving a number in the ground. The improved varieties, however, have the tubers very much larger, and these are mainly quite close to the crown, many of them remaining attached if the plant is pulled up by hand. With these forms, it seems to me, the objection cited is not serious. No one today should think of growing the inferior varieties for economic purposes. One of them (variety *purpurellus*) is offered in the 1919 catalogue of John Lewis Childs as "Pink Tubered Helianti." It is stated that "as a hog or cattle food Helianti is far superior to anything else, but as a table vegetable it must rank high." This is, of course, nonsense, for the tubers are very small and practically worthless, as compared with several other varieties.[2]

[1]Determined by Mr. Ferris of Stanford University.

[2]A letter to the Childs farm, asking where they obtained *purpurellus*, brought no answer. From the apparently Italian form of the name "Helianti," and the close general resemblance to the original plant introduced into Italy and figured by Fabius Columna in 1616, which had reddish tubers, I suspect that we have an Italian derivative of the typical *Helianthus tuberosus*.

Probably the tubers will be found more valuable for feeding animals than as human food, but they make an excellent vegetable, and can be prepared in a number of ways. The taste is peculiar, not unlike that of the globe or true artichoke, which is an entirely different sort of plant. Some are exceedingly fond of them; others do not care for them at all. Mrs. Cockerell has prepared the following recipes for cooking, which first appeared in *Scientific Monthly*, March, 1918. They should be ***put in boiling water***, a few tubers at a time, so as not to lower the temperature; steaming would probably be still better, reducing the loss of soluble contents. The boiling should continue 15–20 minutes (possibly less at sea level), when the skin is easily removed. At this stage the following recipes may be employed, but in the case of the salad (No. 2) the cooking should last a little longer:

1. Soup may be made with the addition of celery tops rubbed through a colander, with milk, or stock, or cream added.
2. The cooked tubers sliced with egg, or celery, or endive, served with French dressing or mayonnaise, make a delicious salad.
3. Slice the boiled or steamed tubers, cover with milk, use salt and pepper to taste, cover with bread crumbs, and then bake for an hour. Grated cheese may be added to this dish.
4. Slice boiled tubers and fry with steak or chops.
5. Slice boiled tubers, mash, add cream, salt and pepper; or cream by adding sliced tubers to rich white sauce, and serve with toast.

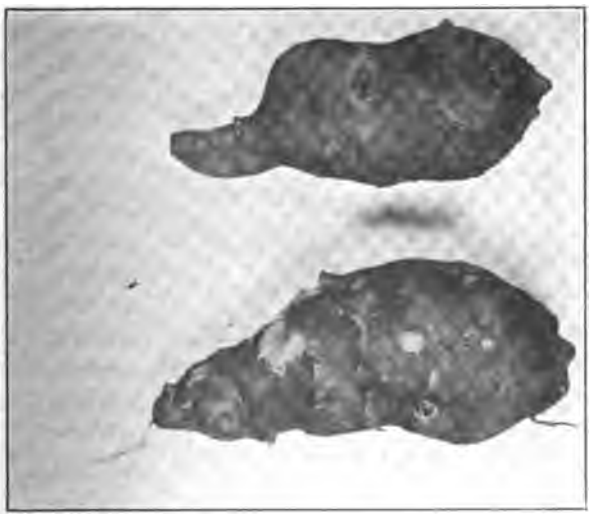

FIG. 113—*Helianthus tuberosus* var. *fusiformis* of the Jerusalem artichoke (Sutton's Rose).

For table use, the most prolific variety (Sutton's or Dreer's white) is troublesome to peel, because so many of the tubers are knobby or irregular. The skin is very thin, and the tubers may be eaten skin and all, but this spoils the appearance of the dish. The smoothest variety, among the larger sorts, is Sutton's rose (variety *fusiformis*). The tubers are shaped much as a sweet potato, only occasionally irregular. This form grows more slowly than the others, and makes a smaller plant. In good soil this variety will run thirty tons to the acre or over, but it will not produce as much as Sutton's white. Under favorable conditions we got over four pounds to the plant.

Sutton's purple (variety *purpureus*) was described by me as having the tubers formed as in the white variety, but rosy-purple (*American Naturalist*, 1919, p. 191). On comparing larger quantities, I must correct this statement to the extent of saying that the tubers of *purpureus* average considerably smaller and are more regularly oval or oblong. The same is true of the Boston subvariety of *albus*. These varieties are not constantly different in the form of the tubers, but when seen in quantity the average difference is conspicuous enough.

In digging one hill of *albus* (Sutton's white) we found a number of enormous tubers, covered with knobs. It seems possible that we have a mutation, which may prove to possess some value for stock feeding. Even if the yield is not increased, the gigantic tubers would be convenient to harvest. One of these tubers, six inches long (variety *multituberculatus*), is illustrated. It presents a certain analogy with the Brussels sprouts variety of cabbage.

I found the variety *purpureus*, in the same field as the others, to produce at the rate of about thirty tons to the acre.

Experiments were made to determine the best way to plant. The tubers should be cut up, in the manner of potatoes, and planted about three inches deep. Even when very small tubers were used, or larger ones very much cut up, the stand was excellent. The best results were obtained when the tubers were planted about twenty inches apart in the rows, and the rows twenty inches apart. This, of course, without cultivation. When the tubers (Dreer's white) were planted only ten inches apart I got only about one and one-half pounds to the plant. The total yield for the space

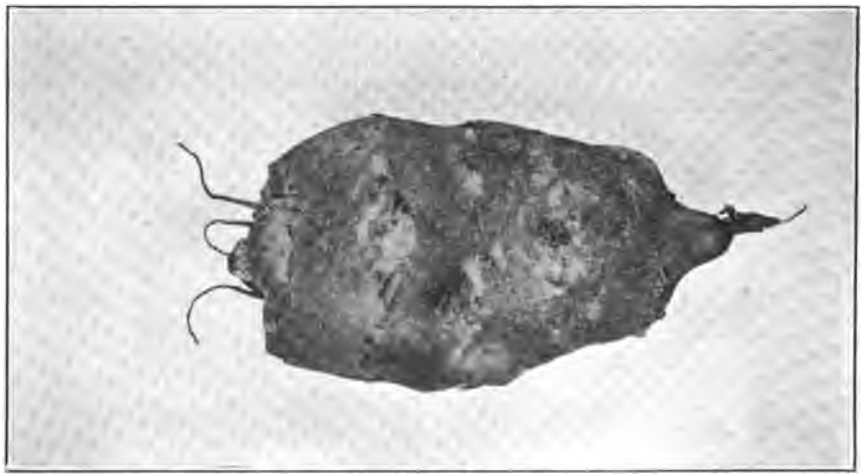

FIG. 114—*Helianthus tuberosus* var. *purpureus* (Sutton's Purple).

was about the same as when the same variety was planted twenty inches apart, but twice as many seed-tubers were used, and, with twice as many plants, the difficulties of harvesting were considerably increased. Indeed, probably this estimate is really too favorable to the closely planted plot, as one side of it was along the border of the field, next to the ditch, and the plants in the outside row brought up the average.

The rapid growth of the tubers at the end of the season is a striking feature of the girasole. Thus as late as September 15 ten tubers of Dreer's white weighed all together only 4½ ounces, the largest one less than 1 ounce. At this period, also, the tubers lack the distinct sweet taste they acquire later. Yet by November 2 the tubers of the various varieties were fully developed, and a plant of Sutton's white gave 12 pounds.

The following key to the varieties (tubers) may be convenient for identification:

Tubers elongate, subcylindrical or subfusiform.
- Large tubers, not rarely with knobs; color pale brown slightly suffused with rose—*fusiformis* (Sutton's rose).
- Small tubers, at ends of rhizomes.
  - Fusiform, abbreviated, deep pinkish-purple—*purpurellus* (Child's Helianti).
  - More elongated, not purple.
    - Claviform, compressed at end, white with very thin brownish skin—*alexandri* (wild in Michigan).
    - More elongate, or rarely claviform, not compressed at end, much browner—*nebrascensis* (wild in Nebraska).

Tubers subspherical, with usually large knobs.
- Rosy-purple—*purpureus* (Sutton's purple).
- White, with thin brownish skin—*albus* (Sutton's and Dreer's white).

Vilmorin in France advertises another variety, with yellow tubers. Mr. H. Walton Clark writes that the common wild form at Fairport, Iowa, has small elongate yellow tubers with a pronounced flavor. He has also found another kind, about the same shape, but with larger red tubers. This latter is much more prolific, and he supposes it to have been cultivated by the Indians. Mr. Clark has kindly sent me tubers of these varieties, and I hope to grow them during the coming season. I tried in vain to procure the French varieties from Vilmorin. Some which were sent in April, 1918, took about a month to reach me, and what with the long journey and the treatment they got on the way (they were fumigated with carbon bisulphide for twenty-four hours in Washington) they were entirely dead when they arrived. This year, Vilmorin refuses to even try to send them.

There is a great deal more to be done with the wild forms. These are not of any particular economic value in their present condition, but they may afford characters which will be useful in crosses. At Boulder, unfortunately, the plants did not go to seed, the season being too short. I was, therefore, unable to make crosses, but I have transmitted tubers of all my varieties to the University of California, where it is hoped that crosses can be made. Professor J. W. Crow, of the Ontario Agricultural College at Guelph, Canada, writes me that he has tried for years to procure seed from *Helianthus tuberosus*, but without result. He has grown them under glass, so as to give them as long a season as possible, "and while they produce magnificent crops of tubers and blossom freely, they do not appear to set seed, although they grow ten or twelve feet high." It is therefore possible that even in California there may be difficulty in securing the desired crosses.

The two wild forms I have, varieties *alexandri* and *nebrascensis*, are quite distinct and might be regarded as species, *Helianthus alexandri* and *H. nebrascensis*, respectively. They are species of minor grade, and no doubt, as the late Mr. Alexander maintained, there are many others equally distinct.

In the French report, already cited, it is stated that "sixty years ago Kade proved by his experiments that this plant can be grown on the same ground for at least thirty years without a decrease in yield, thus demonstrating that it does not exhaust the earth as most plants do." In our work at Boulder we have been unable to see any difference between plants grown where others had been before and those grown on new ground, but our experience has been too brief for conclusive results. The French believe that the plant actually enriches the soil.

Mr. Russell N. Loomis, of the University of Colorado, found that the tubers of the girasole (Dreer's white) would yield a syrup which appeared to have good commercial possibilities. With his kind permission I give his analysis:

Weight of syrup obtained from 2,000 grms. of material, 354 grms.; specific gravity, 1.3099.
Direct polarization at 20° C. in 200 mm. tube, 12.5.
Direct polarization at 40° C. in 200 mm. tube, 9.06.
Invert polarization at 20° C. in 200 mm. tube, 35.8.

Reducing sugar as dextrose by Fehling's	35%
Sucrose in syrup by Clerget formula	17.48%
Levulose in syrup	18.84%
Glucose in syrup, A. O. A. C.	14.81%
Raffinose in syrup	14.55%
Total sugars	65.68%

Raffinose was shown to be present by the mucic acid test.

So far as is now known, it will not be possible to obtain a crystalline sugar from the tubers.

The tubers do not contain starch, but the soluble carbohydrate inulin. One might suppose that a soluble substance would be more readily assimilated than starch, but this seems not to be the case. L. B. Mendel and P. H. Mitchell (*Amer. Journ. Physiology*, Vol. 14, p. 239) made an intraperitoneal injection of inulin into a rabbit, and of 2.8 grms. (in 40 cc. of water) thus injected, 2.2 grms. were recovered in the urine in the next thirty-six hours. It appears that inulase (the enzyme which transforms inulin into levulose) is wanting in the animal (mammal) body, though present in molluscs. Nevertheless, dilute acids, such as the hydrochloric acid of the gastric juice, act on inulin, and presumably change it into levulose, which is available for nutrition. How far this process goes seems not to be clearly known. H. Bierry (*Biochem. Zeit.*, Vol. 44, p. 402) states that inulin is hydrolyzed in the stomachs of

the higher animals by the gastric juice; but Goudberg (1913) holds that the normal conversion of inulin to levulose in the stomach must be slight, and believes that the increased respiratory quotients obtained by him are the result of oxidation of organic acids resulting from the bacterial fermentation of inulin.

H. B. Lewis (*Journ. Amer. Medical Association*, Vol. LVIII [1912], p. 1176) experimented on a healthy man with inulin. He concluded that the extent of hydrolyzation varied with the condition of the stomach. If the general diet is of such a character that the material leaves the stomach soon, the action of the gastric juice is checked by the intestinal reaction before the inversion can proceed far. On the whole, the value of inulin in human dietaries is held by him to be doubtful.

The matter appears to require further investigation with experiments on men and animals. Evidently the value of the inulin content of the girasole tubers will be affected by the character of the rest of the food, and by the secretions of the particular kinds of animals. It may prove practicable and desirable to hydrolyze the inulin artificially before feeding the tubers. Thus a considerable problem, or series of problems, is presented, to be solved through the co-operation of physiologists and chemists.[1] [2]

A few words may be added concerning the common name of the plant. Jerusalem artichoke is cumbersome and unsatisfactory. The plant is quite distinct generically from the true artichoke, and does not come from Jerusalem. In *Scientific Monthly*, March, 1918, I suggested the use of the Italian name Girasole (sunflower), from which our "Jerusalem" is derived. This is shorter and simpler than the French Topinambour. Vilmorin states that in Italy the plant is called Girasolo de Canada, or Tartufoli, but Dr. M. Bezzi writes me that at Turin it is called Ciapinabo, which seems to be a corruption of the French name. In the *Gardeners' Chronicle* of March 23, 1918, a prize was offered for the best name for the Jerusalem artichoke, and in the number for June 8 it was stated that "sunroot" had been chosen. No less than ten competitors had proposed this name. It is open to the botanical objection that the tuber is not a root.

THE STATUS OF THE CODLING MOTH IN ITS RELATION TO THE WALNUT INDUSTRY.[3]

D. B. MACKIE, Los Angeles, Cal.

INTRODUCTION.

In summarizing the results of the past season's activities of the walnut growers of California, the year 1918 will perhaps record the most profitable year this industry has ever known. Demand was great and prices abnormally high were maintained practically throughout the season. However, despite the general prosperity which prevailed, the growers of some districts were forced to stand by and see their expectations of marketing a bumper crop at topnotch prices slowly dissolve and fade away until they considered themselves fortunate to break even. History has repeated itself and once again an insignificant-looking bug has trimmed the profits of more than one walnut grower.

IDENTITY ESTABLISHED.

In this case it has turned out to be our old acquaintance, the codling moth (*Laspeyresia pomonella*[4]). While the present evidence does not mark the first record of this species utilizing the walnut as a host, there are certain features of the present outbreak which lend weight to the supposition that there has been developed a strain of this species which is not only able to complete its life cycle on a walnut diet, but

[1] According to H. Colin (C. R. Acad. Sci., Paris, 1918, quoted in Exp. Stat. Rec.) in the resting tubers of *Helianthus tuberosus* the inulin is changed partly into saccharose and partly into levulose. It will therefore be advantageous to use the tubers in the spring rather than in the fall.

[2] Mr. W. C. Graham, of the Great Western Sugar Company, has kindly investigated the sugar content of tubers of the white variety (Sutton's white) which I raised in Boulder and dug in March. He reports: "We have examined the sample which you sent us, by optical methods, and find the following composition: Sucrose, 8.41 per cent; inulin, 6.15 per cent. We have also tested qualitatively and determined absence of copper reducing sugars. The method of extraction used was the conventional hot water digestion method, same as used with sugar beets."

[3] Since this paper was prepared Prof. Quayle has been assigned to study the bionomics of the walnut codling moth in the field, with headquarters at Santa Ana.

[4] We are indebted to Dr. A. L. Quaintance of the United States Bureau of Entomology for the determination of this insect.

finds the same a congenial host. Adaptation of different forms of insect life to a new food plant is no new phenomenon; in fact there are cases recorded wherein a species has utilized an adopted host even to the extent of practically forsaking the original food plant. Every important outbreak of an insect as a pest owes its continuity to its ability to adapt itself to available food supplies.

NATURE OF THE PROBLEM.

Before discussing the general problem of the economy and potentialities of the codling moth in its relation to the walnut industry, it may be well to present figures depicting losses directly traceable to its presence in the walnut orchards of certain districts. In certain orchards in Orange County as much as 40 per cent of the entire crop was injured and sold as culls. In one packing-house in this same county, according to the statement of the manager, the overhead for extra labor to cull out infested nuts totaled $250 per day. In addition to this, the capacity of the house was reduced from forty-five to fifteen tons per day. Fortunately for the industry, these heavy losses were not general.

FIG. 115—Here the empty sacks are put through the laundry mangle, where heat and pressure preclude the chance of any stages of walnut codling moth escaping.

In any problem where the economy of an industry is involved to the extent to which the walnut industry has been during the past season, it makes no material difference whether losses result from the presence of an insect pest or are engendered by some other agency, the effect upon the industry at large will be in exact proportion to the financial hazard involved; in this case if present conditions are allowed to persist, they will, it is believed, exert a profound influence upon the future of the walnut industry. Thus it will be seen that regardless of whether the present pest were the codling moth or some other species, there exists the same need of keeping its numbers down to the irreducible minimum.

In taking up the problem of the control of any species there are two well-defined lines of action. These are (1) the adoption of measures where the pest exists to keep it killed off to the extent that its presence exerts no noticeable influence; (2) the inauguration of measures to prevent its being taken to districts where it does not already exist. In considering the case in question there are some features

of the present outbreak which are difficult to explain, although it is well known that the codling moth occurs practically throughout the state. There are large districts where both apple and pear orchards are contiguous to walnut groves, and while both pears and apples are heavily infested, the walnuts show no infestation whatever. Why this condition of affairs exists is a question to which it is difficult to furnish a satisfactory explanation and one which the writer does not, from his limited experience, feel qualified to answer, except to state that a complete understanding of this part of the bionomics of the moth will mark an important step in the general problem of its control.

BIONOMICS.

As with all problems of applied entomology, a thorough knowledge of the life history and habits of the species under consideration is a prime essential to successful control. In the case of the codling moth in relation to its feeding habits on walnuts, there is room and need for more extensive field observation. We know, and it is, in fact, well established, that the codling moth in southern California is a pest of apples, pears, etc., has certain fixed habits of attack, also that it has a certain number

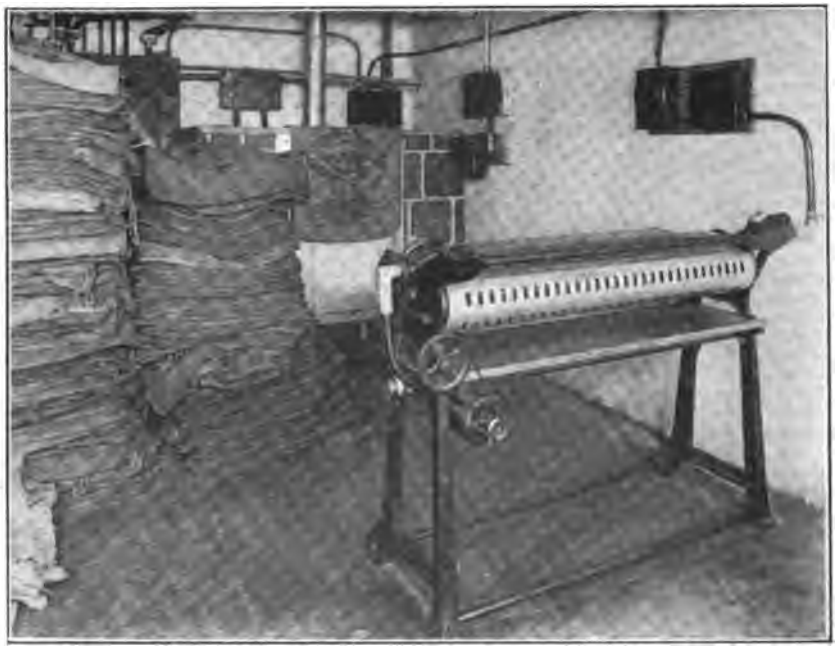

FIG. 116—Laundry mangle: A practical type for the rapid and effective sterilization of empty walnut sacks.

of broods, and that in brief its life history is about as follows: There are at least two broods and sometimes a third. While these broods overlap somewhat, they are of more or less seasonal appearance. The first moths emerge and fly where the apples bloom, and, after mating, the females find the open calyx of the blossom a preferred location in which to lay eggs. The young larvæ of this brood bore into and subsist on the immature fruit. After twenty-five to thirty days they leave this fruit and seek a place to pupate, in which stage they spend about twenty days. Conditions being normal, this brood of moths emerges in early June, mating and egg-laying occupying about a month. The resulting larvæ generally bore into the fruit from the side and feed upon the pulp. There is an overlapping of the broods which sometimes cause the earlier hatched individuals to form the nucleus of a third brood.

As to its development on walnuts, at what season the moth begins its operations, whether it is by the first brood of moths from overwintering larvæ, which emerge about the time the apples bloom, or the second generation, which appears when the

nuts have attained considerable size, we are not yet certain. A number of other points are also in need of elucidation before we have a real comprehensive knowledge of the problem. We know definitely that injury is manifest in June and July, that larvæ are in and leave the nuts about harvest time, and that if left to themselves they will seek some sheltered place in a crevice in the bark, some sack or drying tray, and there spend the winter in the larval stage. These overwintering larvæ transform into pupæ early in the spring and emerge in May or later.

TRADE FACTORS AND THEIR INFLUENCE.

The next question to be considered is whether the methods of handling the crop exert any influence upon the numbers of the moths.

In the general handling of the crop the nuts are gathered daily as they fall. This process may perhaps disturb the moths, which, responding to natural instinct, are seeking a place to spend the winter. Whatever the cause, they sooner or later leave the nuts and, finding suitable location in the drying trays and in the lugs and seams

FIG. 117—Laundry mangle showing how effectively the distribution of codling moth through the medium of infested sacks may be prevented.

of the sacks, there they spin their cocoons and there remain for the winter. According to the degree of infestation of the orchard, so will be the ratio of infestation in the sacks. At this stage of operations we will assume that the product is sacked and ready for sale.

The first step is a kind of preliminary grading to separate the culls. The crop is marketed in one of several ways: (1) Through the California Walnut Growers' Association; (2) some independent association; or (3) sold through a broker or to some other buyer. If the product goes to the Association or an independent house, the sacked crop is delivered and the sacks are returned—it may be in an hour or it

may be in a month. As the full sacks are emptied, the empties are thrown together in a bin or room utilized for this purpose. Here is the first point where distribution may take place, as the worms, before settling down to spin, often crawl around considerably. It is an even chance that they will go into sacks from another lot of nuts. It is generally conceded that, under present methods, a large percentage, if not the greater part, of the infestation hibernates in the sack. This factor in the distribution is constant; it makes no difference whether the product is handled through the Association, independents or other packing houses. Thus a grower may unknowingly take home the nucleus of a thrifty infestation and wonder why he has so large a percentage of wormy nuts in the next season's crop. So much for that part of the crop that is marketed through the regular packing house. Let us turn to that part which is sold to the independent buyer or to the cull dealer.

The cull dealer occupies a prominent part in the trade. In consideration of the element of danger which the trade in this class of nuts adds to the hazards of the walnut industry, it is necessary to take into account the status of the buyer and his method of operation. He will buy whatever he can, anything from orchard run to the poorest culls, and in any amounts wherever he can make a turnover. It may be stated, however, that the most of his trade is in culls. These culls will be small, sunburned, broken, wormy or otherwise off-grade nuts, and as is to be expected in districts where the moth is prevalent a large proportion of the cull nuts are wormy. Generally speaking, he operates on a limited capital and relies on a quick turnover for his profits. When out on a buying tour he may start a deal for a number of sacks of nuts, buying them by the pound, generally in one of three methods: (1) Buys in bulk, furnishing his own sacks; (2) buys the sacked product, the weight of the sacks being included with the proviso that the price, pound for pound, in the weight of the sacks shall be rebated him on their return at the purchase price of the nuts; (3) buys sacked nuts, giving the seller an equal number of sacks to compensate him for those taken; (4) buys the sacks with the nuts at a stipulated price.

Let us now consider the disposition of these nuts. By far the largest portion of the culls for the entire walnut district find their way into Los Angeles. Of the forty-five establishments handling culls this season only two were outside. There is, however, no hard and fast rule in this regard, as the activities of those engaged in this branch of the trade are decidedly transitory. In brief, a buyer buys a few sacks, hires any convenient place, cracks the nuts, and then moves on or closes up until another deal is made. His product may be either graded and the better ones bleached and sold as whole nuts or they may be cracked and the meats sold as halves or pieces to be used by confectioners. A close observation of these cracking establishments showed that practically all of the sacks used for cull nuts were more or less infested, as high as seventy-five cocoons occurring to the sack in some instances. It will thus readily be seen that with these fluctuating infestations acting as centers for dispersion in a trade carried on in the manner above described the possibilities of rapid distribution are greatly augmented.

Reverting to the previous paragraph dealing with the methods of buying cull nuts, it does not take great insight to understand that nuts bought under either of the methods, No. 2 or No. 3, contribute in no small degree to the distribution of the moth in considerable numbers. Should illustration be necessary, the following actual happening is recalled, which will perhaps best serve such purpose: A dealer in culls brought a large consignment of nuts in Carpinteria. He also bought nuts from the infested districts of Orange County. Practically all the nuts were purchased under method No. 2, whereby sacks were to be returned and their price rebated. The empty sacks were piled together in the same room and codling moth larvæ were noticed early in the season crawling over the sacks both on the inside and on the outside. In January this dealer attempted to distribute the sacks to their different owners. Of course the worms were in hibernation three months—but whose sacks were they in? There were sacks from Whittier, El Monte, Santa Ana, Fullerton and Carpinteria. It is believed there was reasonable cause to presume that they were quite generally distributed.

THE DEVELOPMENT OF CONTROL MEASURES.

In the development of control there are two separate lines of application: (1) Measures of control in the orchards, and (2) measures of control in the trade.

FIELD CONTROL.

In the former case it is simply an extension of long-established practices and the development of such new measures as may from time to time suggest themselves. This branch of the investigation is being made the object of extensive study by the

College of Agriculture of the University, who are developing what appears to be a very promising method of dusting the trees with lead arsenate. While it is not the purpose of this article to deal with field control measures, a brief summary of what lines such procedure would follow, particularly in the infested districts, may not be amiss.

This would cover the treatment of walnut orchards either by spraying or by dusting. Later in the season the banding of all trees with burlap would attract many of the worms seeking sites for hibernation, and in this way permit of their easy destruction. The treatment of drying trays also should not be overlooked. Such procedure, if carried out judiciously and persistently and with the concerted action of all growers in badly infested districts, would undoubtedly do much to curtail the present losses.[1]

CONTROL IN THE CHANNELS OF THE TRADE.

We come now to the worm in the trade. In considering this branch of the work it is a well-established fact that exceedingly few worms hibernate or stay in the nuts, and that the great majority find congenial locations and spin their winter cocoons in the sacks. In dealing with this phase of control it simply becomes necessary to exercise proper precaution in treating the sacks and not to allow promiscuous distribution of used sacks coming from questionable sources.

There are a number of means whereby sacks can be treated that will insure the destruction of the codling moth. These include steam, hot water, hot air and others. Practically all of these have been tried out and given more or less satisfaction. Each of them has its merits and, under certain circumstances, can be utilized to advantage. In order to bring out certain points in the experience of past seasons, a brief synopsis of each of these methods will be given, together with its drawbacks.

LIVE STEAM.

The practicability of utilizing live steam is dependent largely on two factors: (1) The packing house being piped for steam, and (2) the steam being delivered at a sufficiently high pressure. Low-pressure steam turns out the sacks too wet and they have to be spread out individually to dry, otherwise they will mold and rot. Taken by and large, the utility of steam depends on whether there is some establishment near by where steam can be made available at a low cost. In general it will also be necessary to have convenient drying racks, otherwise the cost of putting in a boiler is out of all proportion to the work, while the extra labor involved will also add largely to the overhead expense.

HOT WATER.

Hot water is another method that has been tried and which, as a killing agent, is very effective. Its disadvantage is practically the same as with steam, the great difficulty being that the sacks are wet. In one packing house a centrifical dehydrater was installed to remove the surplus water; such machines remove only 66 per cent of the moisture. Thus the sacks would have to be dried as do those treated by low-pressure steam. The cost of such apparatus is also high and involves considerable power to operate.

HOT AIR.

The use of hot air simply involves the baking of the sacks in a chamber or oven. In regard to such methods it should be understood that dry sacks (jute fiber) are very poor heat conductors, and as the transmission of the heat to the inner parts of the stacked mass of sacks being treated is dependent on the conductivity of the mass, one is confronted with one of two disadvantages—a very unequal exposure or a very long exposure to secure thorough permeation. A shorter exposure with a higher temperature would be at the risk of scorching the outer parts of the sacks.

ELECTRIC MANGLE.

A new method devised by the writer, and one which has given excellent results, is worthy of particular mention. It consists in running the sacks through a large mangle, such as is used in laundries for large pieces, sheets, etc. In this

[1] In any campaign which contemplates moth control, the stumbling block will perhaps be the owner of city property who owns a few apple, pear or walnut trees, and who may or may not appreciate the necessity of treating them for the benefit of the walnut grower. Where such cases occur, prompt action should be taken by the county horticultural commissioner.

method the heat is applied locally to every part of the sack and at a much greater intensity than by any other method. It has, in fact, a double action on the moth cocoons: the sacks are fed into the roller at a pressure of over two hundred pounds and in addition they are held against an iron plate that is heated to a temperature of over 700 degrees. Thus the cocoons that are not crushed are cooked. Among the advantages of this method are the following:

1. It is highly efficient as a killing agent.
2. It turns out the sacks in better condition than before treatment.
3. The expense of operating is less than by any other method.
4. It is most simple to operate.
5. It can be installed in any packing house.
6. It takes up very little space.
7. There is no fire hazard.

A machine of the type above referred to has been in operation for the past four months at the central packing house of the California Walnut Growers' Association. Since its installation over 50,000 sacks have been processed. Whether it has done the work can be best judged from the opinion expressed by Mr. Carlyle Thorpe, the Association manager:

> "I believe that Mr. Mackie has finally hit upon the most logical method of eliminating worms from bags which have contained infested walnuts through the use of an electrically-heated laundry mangle. This machine gets a double shot at any worms that may have secreted themselves in the bags, as in passing through the mangle irons the bags become so hot as to kill any live matter in them, and also they are passed through these irons under such heavy pressure that any worms not cooked would be squashed.
>
> "This machine has the advantage over other methods experimented with, in that it turns out the bags in better condition than before treatment, while all of the other methods which have been tried have left the bags in a more or less damaged condition. The process of steaming them has left them wet and subject to becoming moldy. When the bags have been boiled, they come out so wet, of course, they have to be spread out and dried in the sun."

The cost of a mangle such as has been in use by the Association is $275, plus about $10 for installation. The cost of operation may be best figured by multiplying the consumption, which is 4.8 kilowatts per hour, at the prevailing price for current. This averages about fifteen cents. Its capacity varies according to the kind of sacks treated—*i.e.*, grain or regular walnut sacks—the skill of the operator and the number of sacks in a sack lot. If the number is large the cost runs lower; where they are in small lots and must be segregated the cost runs higher. In the experience of the Association, with even the large walnut sacks, the price has not run over a half cent per sack, and the assertion is ventured that with certain modifications the cost can be cut in half.

SUMMARY.

In summarizing we find that we are faced with the problem of combatting a well known pest that has extended its list of hosts to include the walnut. Damage caused during the past year demonstrates that this moth has all the potentialities to develop into our most serious walnut pest. The investigations of both the University of California and the State Commission of Horticulture have shown that the pest can be more or less successfully controlled both in the field and through the channels of the trade and that it is only necessary that concerted action be taken by the growers in the infested districts in applying the known measures to combat the infestation. The control of the pest is in a large measure dependent upon the degree to which walnut growers will co-operate with the officials of the University and the State and County Commissioners of Horticulture in putting into effect the different measures which are available to bring about its control. In brief, it would seem that if the walnut growers do not adopt measures to change the status of this pest it will, if allowed to continue unmolested, not be long before the pest will change the status of the walnut industry.

CONTROLLING MEALYBUGS BY THE USE OF THEIR NATURAL ENEMIES.[1]

By H. M. ARMITAGE, Alhambra, Cal.

The majority of the economic insect pests of California are species introduced before the present-day quarantine measures regulating the movement of plants and plant products into the state became effective. Unfortunately, these pests were introduced without their check in the form of natural enemies and, as is to be expected, they have proven much more serious here than in their native habitat.

Since the introduction of *Novius cardinalis* Muls. by the United States Department of Agriculture, and its subsequent success in controlling the cottony cushion scale (*Icerya purchasi* Mask.), the Insectary Division of the State Commission of Horticulture has concerned itself with searching for natural enemies of other introduced insect pests, with acclimating them in California and with liberating them in small colonies wherever their hosts occurred. It was not until the citrus growers of southern California, dissatisfied with the expensive and unsatisfactory control methods in use, appealed to the Insectary for assistance in the control of the citrus-feeding mealybugs, which were proving a most serious pest in many of the citrus sections, that the rearing of natural enemies on a large scale was contemplated. In response to this appeal a branch was established at Alhambra, in Los Angeles County, in the fall of 1916, for the express purpose of rearing and distributing natural enemies of the citrus-feeding mealybugs, on what may be termed a commercial scale.

There occur in the citrus orchards of southern California three species of these citrus-feeding mealybugs which may be considered of economic importance. They are, in the order of the seriousness with which they occur, *Pseudococcus citri* Risso, commonly known as the citrus mealybug, which occurs throughout the coast counties and is particularly severe in San Diego, Ventura, Santa Barbara and Los Angeles counties; *Pseudococcus gahani* Green, known to the growers of the infested sections as the citrophilus mealybug, which occurs in San Bernardino County at Upland and Cucamonga, in Riverside County at Riverside and in Los Angeles County in and around Pasadena; and *Pseudococcus maritimus* Ehrhorn, or the Baker mealybug, which occurs in all of the counties but which is most prominent in Orange County. During the past season there has been added to this list a new species to California, *Pseudococcus krauhniæ* (Kuwana) or Japanese mealybug, a rather heavy infestation of which occurs on navel oranges at Ojai, in Ventura County. Fortunately, this infestation is isolated from other citrus sections and there is little danger of immediate spread. An attempt to eradicate it is under consideration by the State Commission of Horticulture at the present time.

The establishment of the branch at Alhambra was due not only to the fact that it was a central location, but, primarily, to the fact that all of the above species mentioned, with the exception of *Pseudococcus krauhniæ*, occurred in that locality, and there would be no danger from material, reared as food for the natural enemies, escaping to adjacent orchards.

The first problem which confronted the branch was to determine which of the many natural enemies of the mealybug occurring in California it would be possible and worth while to rear and distribute on a large scale. The ideal natural enemy would be one which had no natural enemies of its own, which would attack any species of mealybug in any stage and one which would readily lend itself to rearing in confinement. The requirement that it should feed on any species of mealybug in any stage meant that it must come from among the predators, as parasites have a very strong tendency to work in one particular stage of their host. Considering our native predators from the standpoint of these requirements, the brown lacewings, *Sympherobius barberi* and *Sympherobius californicus*, both excellent winter and spring predators, are, unfortunately, at times very highly parasitized themselves; the same is true of the green lacewings (*Chrysopa* sp.). The rearing of any one of these also requires a good deal of individual attention. The coccinellid, *Hyperaspis lateralis*, another native predator, which often does good work on *citri*, does not

[1]This article by Mr. Armitage gives in brief form an outline of the work of the State Horticultural Commission against the citrus-feeding mealybugs in southern California. While this type of insect control is in its infancy, it already has been demonstrated to be practical and a great money-saver in the case of the mealybugs.—*Harry S. Smith.*

readily adapt itself to the citrophilus or the Baker mealybug, and also requires considerable personal attention in rearing. A dipterous predator, *Leucopis bella*, is partial to egg-masses, while several coccinellids of *Scymnus* sp. are so small that they do not have the capacity to cope with a severe infestation. This really cleared the field for a coccinellid, *Cryptolæmus montrouzieri*, introduced by Koebele from Australia at about the same time as *Novius cardinalis*, and which had since been known to do good work on *P. citri* in the coast counties. It had no known natural enemies of its own, was a voracious feeder, proved to be able to adapt itself to the citrophilus and Baker mealybugs, and was very easily raised in confinement, practically the only requirement being an abundant supply of food.

This one requirement, having decided to concentrate efforts on this predator, brought up the second problem of the work, the maintenance of a sufficient food supply. It is impractical to attempt to collect enough mealybug-infested material in the field to rear any quantity of these coccinellids, even in summer, when infestations are at their height. In winter, when they are at their ebb, it would be impossible. The first efforts at rearing a supply of food in confinement were made with citrus fruits, but it was soon found that though a good supply might be maintained for a short period it was soon exhausted owing to the drying up of the fruit. The short life of the fruit made it impossible to mature the mealybugs on the same fruit, preventing any material increase in the host through reproduction. Searching for a host of the mealybug which could be handled easily and which would be available at all seasons of the year, it was found that the potato sprout met these requirements best. The mealybugs readily adapted themselves to the sprouts and the sprouts lasted long enough to cover more than a full generation of the mealybug. Unfortunately, the first potatoes brought into the insectary were infested with tuber moth, which flourished under the summer condition which was maintained in the building and became such a pest last summer that it became necessary to discard the potato as a host for a period of several months in order to rid the building of its presence. During that period lemons were used entirely to the disadvantage of our food supply, and only recently have we found it possible to again use potatoes. Our present supply is obtained from Idaho, as that is one of the few potato sections of the West in which the tuber moth does not occur.

The rearing of the potato sprouts is somewhat of a problem in itself. Unfortunately, we are not now equipped with a dirt basement, which presents the most suitable conditions for sprouting, and we have had to try and reproduce those conditions in upstairs rooms. The tubers are placed in trays 15 inches by 17 inches by 2½ inches, bedded in and covered over with sphagnum moss, which method has seemed to produce the most sturdy sprouts in the shortest time of several methods tried. These trays are placed on racks in a darkened room, where we try to maintain a normal humidity of 70° by keeping the moss moistened, and a temperature of 70° through the use of gas heat. A certain amount of aeration is also essential. Under these conditions, sprouts averaging three-eighths inches in diameter and sixteen inches in length are produced in thirty to forty-five days. In a dirt basement at Sacramento sprouts six feet in length were raised, showing the possibilities. The Insectary Division is carrying on investigational work in order to place this part of the work on a more definite basis.

These trays of sprouts, when they have reached the desired size, are transferred to an adjoining room, where they are infested with mealybug from material brought in from the field and which consists mostly of *P. citri*. This takes about thirty days. Once a supply of infested potato sprouts is secured it is unnecessary to collect further in the field, as reproduction occurs among the mealybug sufficient to keep new material infested at all times.

In the rearing of *Cryptolæmus*, a light cage, 19 inches by 19 inches by 4 feet, covered on three sides and the top and bottom with a light cloth and on the fourth side by two glass doors, is used. Inside the cage are arranged three racks, on which trays of infested material are placed. The procedure followed is to place a tray of well-infested potato sprouts on the top rack and add from 25 to 50 adult *Cryptolæmus*, as the amount of food may warrant. Under a temperature of 80° F., larvæ will begin to show up in fifteen days. Upon their appearance the tray is moved down one rack and a new tray of infested material placed on the top rack with the same number of adult *Cryptolæmus* as the first. As soon as the larvæ begin to appear in the second tray, both trays are moved down one rack each and a new tray started on the top rack as before. In the meantime, as needed, food is added to the lower trays by means of fresh infested lemons obtained by placing fresh lemons on

trays of infested potato sprouts in the infesting rooms and leaving them for twelve to twenty-four hours, during which time quantities of active mealybugs transfer themselves to the fresher material. In the bottom of the trays are placed a quantity of dry orange or lemon leaves, into which the full-fed *Cryptolæmus* larvæ crawl from the trays for pupation. By the time larvæ begin to show in the third tray added to the cage, those in the first tray have matured and the adults collected from the cage for distribution in the field. The tray is removed from the cage, cleaned out, and started again on the top rack, and thus the rotation is continued. From the time the first tray is started to the time of emergence of adults from that tray, a minimum of forty-five days has elapsed. It is possible to rear in each tray from 300 to 500 adults. As may be expected, there is considerable variation between cages and they do not all turn out as they should. Barring an unexpected food shortage, we can, in the main, depend on the foregoing results.

The policy to be adopted governing liberations of these beetles has been somewhat of a puzzle. To a certain extent the liberations will be governed by supply and demand. It is certain that the demand will always greatly exceed the supply, and at the same time there is no limit to the number of individuals which could be beneficially liberated on one infestation. Under natural conditions where *Cryptolæmus* occurs in the orchard they will clean up the infestation without assistance—but they do it too late to protect the tree. There must be an abundance of their host present before they can increase in sufficient quantity to control the infestation, and during that period the tree suffers severely, often becoming devitalized to such an extent that it is worthless commercially for that and possibly the next season. By having *Cryptolæmus* available for liberation in the spring they can be liberated in a quantity which will give them an equal start with the mealybug, and while the latter may increase for a short time it will not reach the stage where it will seriously injure the tree or crop. In support of this, a demonstration may be cited which was carried out at Santa Paula, in Ventura County, during the past season. In the spring of 1918, liberations of adult *Cryptolæmus* were made in what is known as the Culp orchard at Santa Paula, which had been heavily infested with the citrus mealybug, year after year. Colonies were liberated as fast as they could be supplied, beginning with May 1 and continuing through June. In all, 6,900 adults were liberated over about two acres of very large infested lemon trees. By July the infestation had reached a stage which permitted the *Cryptolæmus* to obtain a strong foothold, and sixty days later single individual specimens of mealybug only could be found after diligent search, and a little later not at all. There were no visible signs of injury to the trees or crop, and as soon as the winter rains had removed the sooty mold fungus from the trees there was no indication that the orchards had ever been infested with such a serious pest, a condition which had not occurred in that orchard for a number of seasons. In contrast, during this same period a similar infestation occurring in Santa Barbara County was kept under observation, as *Cryptolæmus* were noted as being present in limited numbers. They increased in numbers much more slowly than at Santa Paula, and a clean-up was not effected until about October 1. During that period the trees were practically defoliated by the feeding of the mealybug, and the fruit—what there was of it—was of no commercial value. Had the *Cryptolæmus* had an equal start with the mealybug there is no question but that the orchard would have suffered no commercial injury. In both cases it was later possible to make heavy collections of adults which were starving for lack of food, and to distribute them in other infested orchards. While they will spread a limited distance themselves, they will starve before they will travel any distance in search of food. This brings up another phase of the work. A heavy infestation will produce in sixty days more adult *Cryptolæmus* than we could raise in a season of confinement. If heavy infestations of mealybugs can be found early enough in the season to make the collections of *Cryptolæmus* from them available for use that season, our plan is to concentrate our liberations in those orchards and where possible to depend on them for material to stock other orchards in their vicinity.

During the past season 54,330 adult *Cryptolæmus* were liberated on 95 mealybug-infested properties. About 60 per cent of these were collected in the field, the balance being reared at the Insectary. This season the equipment has been doubled, and, with a better knowledge of the subject, these figures will be increased greatly during the coming year. The liberations during the past season ranged from the coast as far inland as Upland and Riverside, and excepting where the infestations were very light, and we could not liberate in sufficient quantity to meet such conditions, beneficial results were apparent. Any of them would compare more than favorably with any expensive mechanical control, and at no cost to the grower.

While we have been concentrating our efforts on the rearing of *Cryptolæmus*, we have at the same time used several cages in the rearing of a very small hymenopterous parasite of *Pseudococcus citri*, *Paraleptomastix abnormis* Girault, which was introduced from Sicily by the Insectary Division about four years ago. We are making an effort to liberate this parasite in large colonies wherever its host occurs. It seems to be admirably adapted to the California climate and establishes itself very easily. It has been observed to successfully pass through fumigation and spraying, a valuable characteristic in this age of mechanical control of insect pests. This is probably due to the fact that its short life cycle and overlapping generations insure that at all times a reasonable percentage occurs in the pupal stage, which would be the most resistant to such treatment.

Ants where present, and they are nearly always present where there is mealybug, are a serious barrier to insect control through the use of natural enemies. They protect the mealybug by hovering over it and driving away or preventing in other ways the work of the natural enemies. However, the science of ant control is progressing very favorably under the leadership of Mr. R. S. Woglum, of the Federal Bureau of Entomology, and we are advocating control measures for both Argentine and native species wherever we make liberations in accord with the recommendations of the Bureau.

BITS OF FIG HISTORY IN CALIFORNIA.

By I. J. CONDIT. Berkeley, Cal.

According to the Report of the Secretary of Agriculture for 1859, Cortez carried the fig tree to Mexico in the year 1560. It was probably not until 1769, over two hundred years later, when the first mission was founded at San Diego, that the Mission fig became established in California. For about one hundred years longer

FIG. 118—A famous fig tree of the Smyrna type at Parlier with spreading branches supported by props.

this one variety of fig held undisputed possession of the field, being widely planted around most of the early settlements. The Mission fig still ranks high in favor in California, standing third in point of production and given first rank by some for certainty of crop.

The introduction of new varieties and their testing was largely handled by nurserymen and individuals. Among the early importers of varieties who deserve considerable credit for their interest in the industry are Felix Gillet of Nevada City, W. B. West and G. N. Mileo of Stockton, F. Pohndorff and John Rock of Niles, John Grelck of Los Angeles, Gustav Eisen of San Francisco, and pomologists of the United States Department of Agriculture. It is surprising to some that the list of California fig varieties is so extensive. My notes and records show that during the last sixty years at least 159 different varieties of edible figs have been tested out in some part of California, and there are numerous others mentioned in literature which have never been introduced and are probably not worth a trial. It is generally recognized that three varieties, the Calimyrna, the Adriatic and the Mission, occupy the field of dried figs to the exclusion of practically every other variety. It is far different, however, with varieties of figs for fresh fruit. There is no doubt whatever that many choice varieties which are now known only to a few individuals will in the future be widely planted when their good qualities are recognized. Climatic conditions influence markedly the proper maturity and quality of figs. Each locality should work out a set of varieties which give most satisfaction as table fruits in home orchards, for few trees are more certain of crop production than fig trees.

During the period when so many fig varieties were being tested the fame of the true Smyrna fig had by no means escaped the attention of California horticulturists; many were the attempts to secure real trees and frequent the discussions regarding

FIG. 119—These Adriatic trees growing near Biggs are part of the large planting made about 26 years ago. They are 25 feet apart and are said to average five tons of dried figs per acre. Note the numerous trunks.

the identity of this imported fig which enjoyed such a reputation in the markets of Europe and America. These attempts invariably ended in discouragements, and as late as July 23, 1887, the editor of the *Pacific Rural Press* wrote of the genuine Smyrna fig as an *ignis fatuus* which has shone before the eyes of horticulturists for years and impelled them to great expenditure and adventure for naught. The wily Asiatics were given credit for their cunning "in foiling every attempt put forth by California-Yankee ingenuity to seize and bear hence the priceless variety which makes their town famous the world around."

The report of the fig committee of the State Horticultural Society, November 29, 1889, presented by B. N. Rowley and G. P. Rixford, concluded that the true type of Smyrna fig had not been produced in California up to that time, and among other things that growers of figs in California were impatient and expected too much of their trees. "The Smyrna fig tree does not produce and mature its true type fruit until the eighth to tenth year from planting even at Smyrna, the home of the fig." And yet at that very time there were growing in California thousands of true

Smyrna trees which only required caprification by means of the fig wasp, *Blastophaga grossorum*, in order to produce profitable crops.

Mr. E. W. Maslin of Loomis determined to test the facts regarding the true Smyrna fig by planting the seeds of such figs. In the spring of 1885 he bought a box of large Smyrna figs in San Francisco, washed out the seeds and planted them in a hotbed. In 1886 the seedlings were transplanted on a hillside in deep granitic soil. In 1889 the trees set fruit which, however, failed to mature. Determined to have the best seed available, Mr. Maslin obtained some choice imported Smyrna figs from Thurber & Co., New York, and planted these seeds in 1886. From 153 seedlings planted in orchard form, 139 trees came into bearing, 74 being caprifigs and 65 Smyrna figs. The caprifigs were colonized with Blastophaga about 1898 and many interesting and valuable capris, as well as promising varieties of the Smyrna type, resulted. In 1908 the orchard was leased by the Department of Agriculture, and since that time caprifigs in small quantities have been supplied to growers at a nominal cost. Large numbers of seedlings and cuttings have been freely distributed to growers for trial, the local distribution being in charge of Mr. G. P. Rixford of San Francisco.

The history of the introduction of the true Smyrna fig into this state has been given to me by Mr. G. P. Rixford, and is substantially as follows: Mr. Rixford was connected with the San Francisco *Bulletin* in 1879 and was firmly convinced that Smyrna figs just as good as those produced in Asia Minor could be grown in California. He, therefore, made arrangements with Mr. E. J. Smithers, the American Consul at Smyrna, to send over some cuttings. The method used in packing was as follows: Holes were bored in thin boards and then the boards split; a cutting was then placed in the semicircle thus made and the dirt packed around the base of the cutting. When the 448 cuttings arrived in California it was found that the bases of the cuttings were largely decayed, but many of the tops were still green and some were propagated. There were too few, however, to carry out the original idea of giving the cuttings out as premiums to subscribers. The following year Consul Smithers was transferred to a station in China, but en route he stopped in San Francisco and called on Mr. Rixford. He said there were 4,000 rooted cuttings in Asia Minor which could be obtained at eight cents each. Accordingly Mr. Rixford sent word to hold the cuttings for him and arranged to send $350 over to pay for them and the packing. The owner, however, sent back word that the plants had grown so vigorously that they were three or four feet high and were worth $1.25 each. Mr. Rixford, therefore, sent back notice that he would wait until fall and take cuttings.

W. B. West, E. W. Maslin, Governor Stanford and others became interested in the venture and each contributed $50 or more towards its success. Arrangements were made to ship some moss over from New York to use in packing the cuttings. When they arrived in New York they were examined and repacked by Peter Henderson & Co., and sent on to California by the southern route to avoid frost. They were delayed, however, along the way, and an appeal was made to Governor Stanford, who was an official of the Southern Pacific Company, to trace them and hurry them along. The shipment was located somewhere in New Mexico and was reshipped the remaining distance by express at the same rate. The cuttings (about 14,000 in number) were found to be in good condition and a large number were propagated. Many were grown on the Stanford ranch at Vina. They were distributed widely in California and some reached Arizona. The trees grew and thrived, but in all cases failed to mature fruit until the introduction of the fig wasp a few years later.

In the year 1886, the Fancher Creek Nurseries of Fresno, being convinced that the White Adriatic fig could never be made to equal the Smyrna, decided to send an employee, Mr. W. C. West, to Smyrna to secure cuttings and all possible information regarding the industry in that country. After considerable difficulty, Mr. West succeeded in obtaining about 20,000 true Lob Injir cuttings, several thousand caprifig cuttings, and several hundred cuttings each of Kassaba, Bardajic and Cheker Injir figs. About half of these cuttings reached Fresno and formed the beginning, in 1888, of the Roeding home orchard on Ventura avenue, Fresno. In 1889 twenty acres additional were set out, and in 1891 still twenty more. This extensive planting bore no fruit whatever, except a few pollinated by hand, until the successful establishment of the Blastophaga in 1900. Mr. George Roeding stated at the Fig Institute in January, 1918, that the discouragements and difficulties incident to the establishment of the Blastophaga might have been avoided had his employee in Smyrna "devoted closer attention to the work he had before him instead of allowing his duties to be interfered with by other matters of a more exhilarating nature."

The necessity for the caprification of figs was, prior to about 1890, a common subject for discussion. Mr. B. M. Lelong, Secretary of the State Board of Horticulture for many years, in 1889 stated that the practice was much believed in at one time, but is condemned by most modern writers as absurd. "Caprification, according to the experience of practical growers, is altogether a delusion, and many of the largest plantations of the old world have continued to bear fruit without the aid of

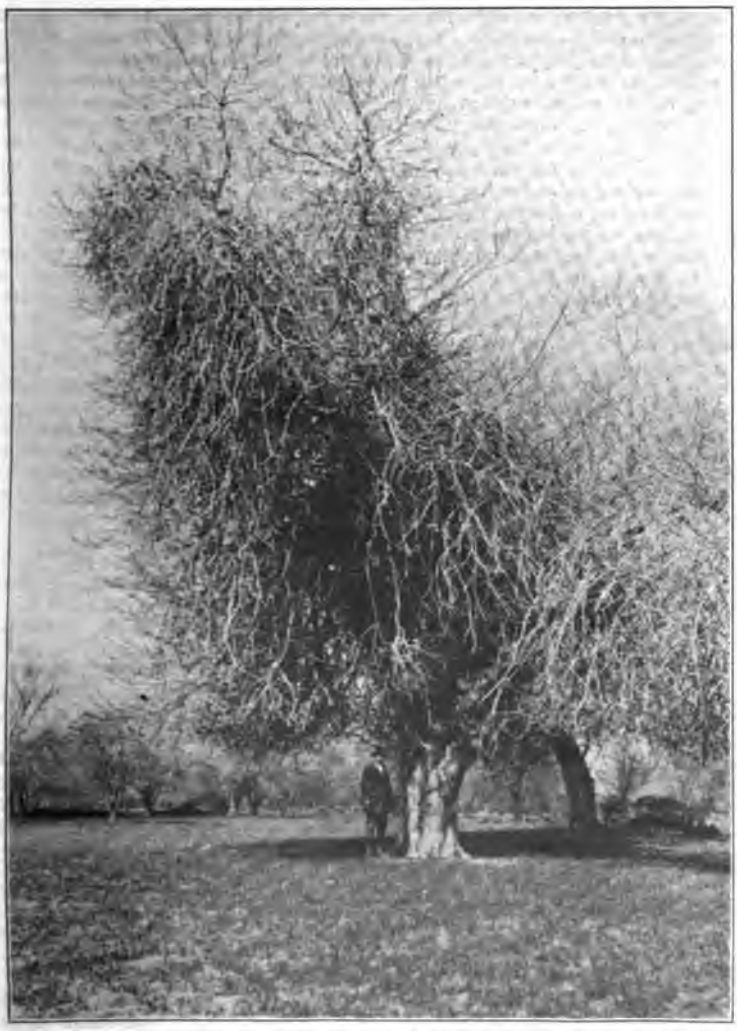

FIG. 120—This Mission fig tree growing near Corning is one of several immense specimens. The largest has a trunk circumference of 13½ feet at three feet from the ground.

the caprifig." He refers to Gasparrini, who recommended the abolishment of the practice, as it only entailed expense and caused the flavor of the fig to deteriorate. A translation of Gasparrini's conclusions is found in the Report of the State Board of Horticulture for 1891, pp. 235–259. Dr. Eisen, however, called attention to the fact that such conclusions made by investigators in France and Italy were worthless since the varieties of figs grown in those countries did not require caprification.

The first convincing proof of the success of caprification in this state was given by Mr. George Roeding of Fresno and later by Mr. James Shinn of Niles, both of whom produced edible Smyrna figs containing perfect seeds by pollinating the small fruit with pollen introduced on the end of a toothpick. Mr. Roeding later improved this method by blowing the pollen through a glass tube drawn out to a point. Smyrna figs thus produced are illustrated on page 231 of the report just mentioned.

The history of the attempts to colonize the Blastophaga, or fig wasp, shows similar discouragements to those encountered in the efforts to produce the true Smyrna figs. The following account summarizes the attempts made at different times.

According to W. T. Swingle, the first introduction was made by H. E. Van Deman in the spring of 1890, who imported caprifig cuttings from Asia Minor. Some of these cuttings had fruits attached and insects emerged; doubtless some were sent to California. Dr. L. O. Howard (1899) states that cuttings were distributed to California and that they took root and grew with extraordinary rapidity. Mr. Roeding in 1910, however, claimed that none of the caprifigs received by Mr. Van Deman were ever forwarded to California, and wrote as follows: "I have a letter from him later in which he expresses his regret in not knowing that I was an interested party."

In the spring, and later in July, 1891, James Shinn of Niles obtained specimens of the Blastophaga, but only one caprifig tree was available and the insects perished for want of figs in which to lay their eggs.

In 1892 Mr. George C. Roeding of Fresno secured several shipments of figs containing Blastophaga from Mr. Thomas Hall of Smyrna. The insects were numerous and active, but they did not become established.

The next introduction was made in the early spring of 1895 by George C. Roeding, who received from A. C. Denotovitch a package of caprifigs in good condition, though the insects never issued.

In 1898 W. T. Swingle sent from Naples, Italy, a number of caprifigs containing insects. These arrived at Fresno in April, each wrapped in tinfoil. In these first figs received there were quite a number of specimens of *Philotrypesis caricæ*, a parasite of the Blastophaga, which were readily distinguished from the female Blastophaga and destroyed as far as possible. Fortunately, the insects did not become established from this lot.

On March 31, 1899, Dr. Howard received from Mr. Swingle, then in Algeria, six boxes of the winter crop of caprifigs instead of the spring crop. These were forwarded to Mr. Roeding also, one box on April 5, and one box on April 6. These were cut open and placed under a tented tree. In the latter part of June, 1899, about twenty figs containing insects were found on the tree, as well as several on neighboring trees. The insects became established in the summer crop, and by November 10 thousands were laying eggs in the winter crop. The Blastophaga has been widely distributed since that time and the commercial production of Smyrna figs has steadily increased.

Although the planting of figs for profit in the San Joaquin Valley has been advocated for many years, it seemed to be necessary for a period of high prices for the fruit, to stimulate extensive development. As far back as February 18, 1888, Judge C. Talbot, in an address before the Tulare Grange, risked the assertion that future demonstration would prove that the western base of the Sierra Nevada range from Red Bluff to Bakersfield at an altitude of from 300 to 1,000 feet will be the region where the best results will be secured from the culture of the fig. He earnestly recommended to the farmers throughout this region to plant fig trees. Returns during the past few years from border fig trees have certainly proved the wisdom of this early advice to plant such trees.

In southern California figs have not been planted as extensively as other fruits, since drying has not been so satisfactory on a large scale as in the interior valleys. Downey in Los Angeles County has long been more or less of a center of fig culture. In 1886 Mr. James Stewart reported that he had for fifteen years past been experimenting with figs and testing out different varieties. It is interesting to note that he credits the so-called White Smyrna fig then being grown as identical to the true Smyrna fig of commerce. He maintained that the White Smyrna fig had been proved superior to the imported fig on account of the thinner skin and finer seed. The Brown Ischia and New Pacific also were recommended as choice varieties by Mr. Stewart.

The work of the Agricultural Experiment Station should not be overlooked in reviewing the history of the development of the fig industry. Previous to 1903 it was the policy of the station to maintain substations in various sections, namely,

at Jackson, Paso Robles, Tulare and Pomona. Bulletin No. 96 of the station shows that in 1892 there were being tested at these four stations about fifty distinct varieties of figs with additional stock in nursery rows. It was found at Pomona that the Angelique, Gros Gris Bifere, Grizzly Bourjassotte and the Mission were not subject to souring so badly as other varieties and were recommended for home planting. The region, however, was not regarded as being adapted to successful fig culture. At Jackson some varieties succeeded better than others, but nearly all did well, experience showing that with proper culture the fig tree does not require any irrigation in such foothill districts and soils. The Du Roi, Brown Turkey, Pasteliere and Hirta du Japon were recommended for the Sierra foothills. At Paso Robles a few varieties stood the climate sufficiently to indicate that some portions of the district were adapted to the fig. Experiments at the Tulare Station up to 1900 showed nothing hardier than Doree Narbus and none of better quality for table use in this district than Du Roi. Among the best commercial sorts were Ronde Violette Hative, Hirta du Japon, Brown Ischia and White Bourjassotte.

Since the crystallizing and preserving of figs is lately receiving renewed impetus in California it may be of interest to some growers to note the following remarks by John C. McCoy of Orange in 1888: "There is a rapidly growing demand for the White Adriatic and Brown Smyrna for crystallizing, canning, jamming and pickling. The establishments for crystallizing figs can not get one-fifth as many figs as the business demands. I know of one such establishment offering to contract to pay $40 per ton for all the figs that could be raised for ten years on twenty acres of White Adriatic and Brown Smyrna. The present price is $50 per ton, and it is not likely the price will be less for years, as the demand for figs, preserved in different ways, is increasing more rapidly than orchards are being planted." The same writer urged growers to plant figs, as he figured a yield of $400 worth of fresh figs per acre with a very small outlay for cultivation and picking.

The use of salt water in dipping figs probably dates back at least to 1884, when G. N. Milco of Stockton advocated the following treatment: "Before packing, the figs should be hastily dipped in clean, boiling-hot sea water to guard against all danger of attack from the worm so destructive to the fruit." Mr. Milco firmly advocated real sea water for dipping the fruit, claiming better results than with an ordinary salt solution. While salt water has thus been used up to the present time, the reasons for its use seem to be vaguely understood. In reply to a question as to the function of salt water used for washing figs, one grower at the Fig Institute of January, 1917, replied that he used salt because his father and grandfather did the same. Salt is supposed to be a preservative and may possibly improve the texture of the dried fruit.

In conclusion, I wish to present a challenge to the county horticultural commissioners and other county officials. I have for several months been trying to locate the largest and oldest fig tree in the state of California. There is presented with this article an illustration of the largest tree of which I have a record, the figures having first been given me by Mr. C. B. Weeks, formerly Horticultural Commissioner of Tehama County. This is growing on the Henry Clark place five miles north of Corning on Thomas Creek, having been planted by a Mr. Headinger in 1861 or 1862. It is one of several immense individuals, the greatest trunk circumference ranging from 11 to 13½ feet at two feet from the ground. The spread of the branches is about 60 feet. There is a large black walnut tree also on the place with a trunk circumference four feet from the ground of 15 feet 10 inches and a spread of branches of 114 feet. I challenge anyone to produce photographs and authentic records of a larger fig tree than the one shown herewith. Where is the largest and oldest fig tree in the state of California?[1]

[1]Since writing this article an account has appeared in the *Pacific Rural Press*, April 12, 1919, of a Black Mission fig tree on the William Curtner place near Mission San Jose, 125 years old and a trunk circumference at the ground of about 17 feet. —I. J. C.

THE PINK BOLLWORM, THE BOLL WEEVIL AND LOWER CALIFORNIA COTTON.

By A. O. PRATT, Calexico, Cal.

Contiguous with the cotton-growing lands of Imperial Valley, Imperial County, California, is another cotton-growing area lying in the Northern District of Lower California. Imperial Valley is divided politically by the boundary line between the United States and Mexico in such a manner that each nation controls approximately one-half of the valley, the United States the northern half, and Mexico the southern half. Lower California itself is a big territory stretching away to the south, its southern extremity lying some 800 miles south of the international boundary line. For governmental purposes it is divided into two districts, called, respectively, the Northern and the Southern. With the Southern District we are little concerned, because with it we have almost no economic relations, but with the Northern District we are very intimately associated. A glance at the map will at once reveal how almost completely the Northern District is isolated from the remainder of Mexico. Because of its geographical position, while politically a part of Mexico, it is economically a dependency of the United States. Practically all of its manufactured goods are imported from the United States and all of its surplus products are exported to the United States. Imperial Valley is its most important agricultural region and the only area in which cotton is produced at the present time. Mexicali, opposite Calexico, Cal., is the seat of government and the customs port through which this cotton is exported to the United States, Calexico, Cal., being the receiving port. Incidentally, Calexico is the only port on the Mexican border through which cotton is permitted entry into the United States.

When the growing of cotton became an important industry in Imperial Valley, Cal., a few American ranchers saw the opportunity presented by the Mexican acres on the other side of the boundary line, and several tracts eventually were leased for cotton planting. The seed for these plantings came from ranches in Imperial County and, for the most part, had been grown by the same men who were then planting on Mexican soil. Since the time these American ranchers began raising cotton in Lower California, growers of many other nationalities have come and the early acreage has been increased until, during the present season, more than one hundred thousand acres are being harvested. Though these acres are in Mexico, most of the growers live in Calexico, Cal., traveling back and forth to their ranches as their business requires. The fact that the growers are no longer entirely of American nationality does not mean that they brought the seed for their plantings with them from their former homes. In so far as careful investigation has yet determined, all of the cotton seed which has ever been planted in the Northern District of Lower California originated either in California or in some state approved by the California State Commission of Horticulture, or was grown in Lower California from the seed originally taken there by the first American growers. During the past two years most of the seed planted was harvested by the Mexican growers themselves and taken back to their ranches either from the gins in Calexico or Mexicali. Furthermore, all cotton seed which has been imported into the Northern District of Lower California, whether originating in California or elsewhere, was imported from California through the port of Calexico. All cotton seed which did not originate in California was first imported into California in accordance with its quarantine regulations for planting in California, a portion of the seed eventually being diverted into Lower California, so that, in fact, the seed planted in the Northern District of Lower California has come from the same source as that planted in Imperial Valley, Cal.

Since the source of the cotton seed planted in the Imperial Valley of Lower California has not differed from that of the seed planted in the California portion of the valley, it readily follows that no cotton pests should have been introduced into one region that had not been introduced into the other. Since the Mexican territory is contiguous with the American territory, of the same soil, with the same climate, and using irrigation water from the same stream, the Colorado River, it is evident that if, in the beginning, dangerous insects were present in the Mexican portion of the valley they must also have been present in the American portion. Numerous entomological surveys, made in recent years, have determined,

in so far as it is reasonably possible to do so, that neither the pink bollworm nor the boll weevil exist in any portion of Imperial Valley, either in California or in Mexico. During the past two years a continuous inspection of cotton proceeding from Lower California has been made at the port of Calexico, and during the past two summers extensive field inspections were made in the growing cotton south of the border. The writer, therefore, feels safe in assuming that at the present time cotton grown in the Northern District of Lower California is free from either the boll weevil or the pink bollworm. It remains only to protect this region against their introduction in the future.

To guard against such an unfortunate event very stringent quarantine regulations have been made. The quarantine order issued by the governor of the Northern District, Col. Esteban Cantu, prohibits the importation into the district of cotton seed except as it comes through the ports of Mexicali and Los Algodones, opposite Calexico and Andrade, Cal., respectively. The quarantine decree, translated, reads as follows:

> "Whereas, the cultivation of cotton constitutes the principal source of the wealth of the district; whereas, the plant, up to the present time has not been attacked by the insect commonly known as the boll weevil, nor by any other; and whereas, it is in the interest of the public welfare to take the proper means to prevent the introduction of infested cotton seed into the Northern District of Lower California, this government has deemed it advisable to decree that cotton seed may be imported only through the frontier customs ports of Mexicali and Los Algodones. The person or persons desiring to make the importation shall first make application to this government for a permit, stating in the application, under oath to tell the truth, the place from whence the seed is coming and the place where the cotton was grown which produced it.
>
> "Prior to the entry of the seed it shall be examined by the expert or experts which the government shall name, and upon the production of a certificate showing that the seed is not infested the proper orders will be given to permit the importation."

Slight modifications made through governmental orders make this decree also include cotton as well as cotton seed, so that, in effect, the decree actually prohibits the importation of either cotton or cotton seed except as it comes from the United States through one or the other of the two California border ports, Calexico and Andrade. Before issuing a permit for the importation of cotton or cotton seed, the governor requires that he shall be presented with a certificate from the proper American official showing that the shipment has been inspected and found to be free from all dangerous cotton insects. This requirement, as well as the provisions of the decree itself, is being strictly adhered to. The writer, who is in charge of the cotton inspection service for the United States Federal Horticultural Board at the port of Calexico, inspects all cotton seed and cotton going into the Northern District of Lower California. No cotton seed which did not originate in California, or which was not imported into California in strict accordance wth its quarantine regulations, has been or will be certified for exportation to Mexico.

It is believed, therefore, that the Northern District of Lower California is adequately protected against the introduction of dangerous cotton insects and that there is no danger to California cotton in permitting the entry of the Mexican grown product. The local Mexican government is fully alive to the importance of the problem and is co-operating in all protective measures. Of this the writer has ample proof, for he is in constant personal touch with those of the Northern District whose duty it is to enforce the quarantine regulations and has been accorded the privilege of making inspections on Lower California soil and of observing the workings of the quarantine regulations of the Lower California government.

TRAPPING INSECTS.[1]

"In cigar factories it has often been noticed that the adult beetles collect on hands of leaf tobacco suspended for the purpose of ascertaining the humidity. Eggs in large numbers frequently can be found on the leaves, and in the rooms where cigars are made or handled young larvæ from these eggs may find their way easily to the cigars. Numerous experiments were made by liberating large numbers of the beetles in a closed room in which hands of leaf tobacco had been suspended about the walls. It was found that a large proportion of the beetles collected on the tobacco. This habit of the insect suggests the possibility, where conditions permit, of trapping the adults in this manner. The tobacco could be collected at frequent intervals and the eggs and beetles killed by heating or fumigating the leaves, and then replaced; thus, instead of being a source of infestation, this tobacco would to a large extent protect the cigars or other material in the room. The method is said to have been tested in a cigar factory in the Philippines and to have shown excellent results.

TRAP LIGHTS.

Specially constructed trap lights may often be used to advantage in factories or warehouses, and a large number of the beetles destroyed. A very efficient trap can be made quickly and easily by pinning together sheets of sticky fly-paper in the form of a cylinder and suspending it around an electric light. The trap is more effective if the sheets of fly paper are pinned so that the surface on both the inside and outside of the cylinder is sticky. Traps of this type operated in a large tobacco warehouse were under observation for some time and were found to destroy large numbers of beetles. Another form of trap consists of a large globe, such as is used for street lights, placed over a funnel, the lower part of the spout of the funnel opening into a cyanid jar, in which the beetles are killed. An electric-light bulb can be used in the globe or a trap light of the same type can be operated with acetylene or other light. Another method of destroying the beetles consists of placing shallow pans of oil underneath the lights. A heavy odorless oil is best for this purpose in case leaf tobacco, which may take up odors of kerosene or other oils, is stored near by. The traps fitted with cylinders of fly-paper will perhaps be found best adapted to most conditions. While adults fly more readily toward blue or blue-violet light than toward red or orange, colored light bulbs or colored screens cut down the intensity of a source of light. Ordinary electric-light bulbs of clear glass of the nitrogen-filled and other types which transmit lights rich in rays of short-wave length have been found well adapted to trapping.

FIG. 121—Fly-paper trap for storage insects.

SEX OF BEETLES COLLECTED AT LIGHT.

A sheet of sticky fly-paper which had been suspended around an electric light in a tobacco warehouse at Danville, Va., in July, 1911, was examined by Mr. S. E. Crumb. Of 100 beetles that were removed and dissected, 36 were males and 64 females. Four females contained, respectively, 2, 2, 17 and 22 mature eggs. Seventeen females contained immature eggs, half developed or more, as follows: 2, 2, 2, 2, 3, 3, 4, 5, 6, 7, 7, 8, 10, 10, 11, 12 and 36. Forty-three females were without eggs. Approximately 32 per cent of the females contained eggs and 68 per cent of the females did not.

[1]From "The Tobacco Beetle: An Important Pest in Tobacco Products," by G. A. Runner. Bull. 737, Bur. Ent., U. S. Dept. Agr. 1919.

COLLECTING AT WINDOWS.

As the light becomes dim in late afternoon in infested warehouses or factories the adult tobacco beetles fly to the windows, often collecting in large numbers on the glass and casings. The beetles may be easily destroyed at such times by brushing them down into pans of water or oil or onto sheets of sticky fly-paper. In a tobacco warehouse visited by the writer the owners make it part of the regular duties of the watchman to visit each window in the building where the beetles collect and sweep them down on sheets of fly-paper spread out on the window sills. Immense numbers of the beetles are destroyed in this way at very little cost.

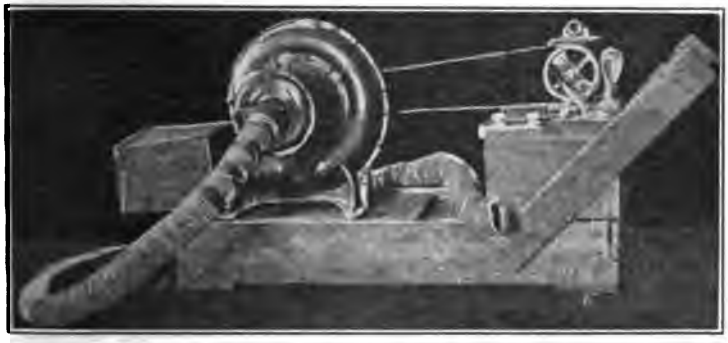

FIG. 122—Vacuum trap for storage insects.

COLLECTING BEETLES BY SUCTION.

The use of suction fans operated at lights for collecting the beetles in warehouses has been reported. There has been no opportunity to test this method. The use of vacuum cleaners operated by electric current might possibly prove to be an effective method of collecting beetles at the windows of warehouses. At Lancaster, Pa., a suction fan was used in one of the large tobacco warehouses. Beetles could be readily drawn from cracks of the building and from about windows, and large numbers were said to have been collected in a short time on several occasions."

NOTE.—While the foregoing article deals with the trapping of insects in tobacco-processing establishments, the wide range of usefulness of these devices with slight modification is readily apparent. They may be utilized in any storehouse or warehouse at a minimum of expense for operating. [Editor.]

BOOKS OF INTEREST TO GROWERS AND HORTICULTURAL OFFICIALS.

Productive Bee-Keeping,[1] by Frank C. Pellet, State Apiarist of Iowa. Fruit growers are interested in the honey-bee, not only on account of its delicious product, but because of its importance in the fertilization of the bloom in their orchards. This interest has become increasingly in evidence of late years, and so the appearance of a new book on apiculture is of more direct importance to them than formerly. "Productive Bee-Keeping," by Frank C. Pellet, now associate editor of the *American Bee Journal*, is a welcome addition to our list of excellent manuals of bee-keeping and is deserving of a place in the library of anyone interested in this phase of agriculture. The subject, always fascinating, is made more so by the author's simple nontechnical style and his evident love for his vocation. The illustrations are good, and the directions are so plain as to be easily followed by anyone.

A chapter of especial interest to California horticultural officials, of which there are now over two hundred, is that on "The Business of an Inspector." The author says: "No man should be intrusted with police powers who does not have proper regard for the rights and feelings of those with whom he is required to deal. He should be able to meet a trying situation and to reason with those who are disposed to resent his visit." He also says, with reference to county inspectors: "While the county system is better than none at all, it is a general rule that police regulations are better enforced through a state or national administration than through a local one."

This book is well worth reading, even by those not directly concerned with bee-keeping. H. S. S.

Peach Growing,[2] by H. P. Gould. One of the latest publications of the "Rural Science Series," edited by L. H. Bailey of Cornell University, is "Peach Growing," by H. P. Gould, pomologist in charge of fruit production investigations, Bureau of Plant Industry, United States Department of Agriculture. This book contains 425 pages full of interesting reading matter regarding very important phases of peach culture and in addition a number of attractive full-page plates, one of which shows a portion of the beautiful Newcastle peach district of California. The titles of the eighteen chapters are as follows:

1. Historical Notes.
2. Economic Status and Extent of the Peach Industry.
3. Location and Site of the Orchard.
4. Propagation of Peach Trees.
5. Details of Planting an Orchard.
6. Orchard Management.
7. The Tillage of Peach Orchards.
8. Inter-planted Crops.
9. Fertilizers for Peach Orchards.
10. Pruning Peach Trees.
11. Insect and Disease Control.
12. Thinning the Fruit.
13. Irrigating Peaches.
14. A Consideration of Adverse Temperatures.
15. Annual Cost Factors in Growing Peaches.
16. Peach Varieties, Botany and Classification.
17. Picking and Packing the Fruit.
18. Transportation, Storage, Marketing.

Its contents are of general interest to peach growers everywhere. G. P. W.

[1] The J. B. Lippincott Company, Philadelphia, U. S. A. Price $1.75.
[2] The Macmillan Company, New York, U. S. A. Price $2.00.

REPORT FOR THE MONTH OF FEBRUARY, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	77
Passengers arriving from fruit-fly ports	2,176

Horticultural imports:

	Parcels
Passed as free from pests	120,995
Fumigated	1,197
Refused admittance	24
Contraband destroyed	39
Total parcels horticultural imports for the month	122,255

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli, Pseudococcus spp., and unidentified *Lepidoptera* on bananas.

From China:

Lepidopterous larvæ (unidentified) in orange peel.
Borers in dry bark.
Cylas formicarius in sweet potatoes.
Aphis spp. on plum trees.
Aspidiotus simillimus translucens and *Parlatoria pergandii* on oranges (Sour Kat) var. *Citrus nobilis.*

From Florida:

Lepidosaphes beckii and *Phomopsis citri* on grapefruit.

From Hawaii:

Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Coccus longulus on betel leaves.

From Mexico:

Lepidosaphes beckii and fungus spp. on limes and oranges.
Chrysomphalus scutiformis and *Lepidosaphes gloverii* on limes.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	18
Fish boats inspected	6
Passengers arriving from fruit-fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	116,817
Fumigated	33
Refused admittance	9
Contraband destroyed	6
Total parcels horticultural imports for the month	116,865

Pests Intercepted.

From Australia:

Calandra granaria in wheat.

From Central America:

Pseudococcus spp., and *Chrysomphalus scutiformis* on bananas.

From Cuba:

Pseudococcus spp. on pineapples.

From Florida:

Phomopsis citri and *Lepidosaphes beckii* on grapefruit.

From Idaho:

Rhizoctonia on potatoes.

From Mexico:

Chloridea obsoleta in tomatoes.

From Oregon:

Cydia pomonella on apples.

From Pennsylvania:

Tetranychus mytilaspidis on rose plants.

From South America (Argentina):
Lepidopterous spp. on potatoes.

From Texas:
Mantis eggs and unidentified lepidopterous larva on persimmon trees.

From Utah:
Sanninoidea spp. in peach tree.

From Washington:
Rhizoctonia and scab on potatoes.
Cydia pomonella on apples.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	21
Fish boats inspected	47
Passengers arriving from fruit-fly ports	30

Horticultural imports:	Parcels
Passed as free from pests	10,754
Fumigated	0
Refused admittance	1
Contraband destroyed	1
Total parcels horticultural imports for the month	10,756

Pests intercepted.

From Central America:
Aspidiotus cyanophylli on bananas.

From Idaho:
Rhizoctonia on potatoes.

From Mexico:
Chrysomphalus citrinus and *Lepidosaphes beckii* on lemons.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	8
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	7

RIVERSIDE COUNTY STATION.

Horticultural imports:	Parcels
Passed as free from pests	30
Fumigated	3
Refused admittance	0
Contraband destroyed	2
Total parcels horticultural imports for the month	35

Pests intercepted.

From Florida:
Lepidosaphes beckii on citrus fruit.

REPORT FOR THE MONTH OF MARCH, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	81
Passengers arriving from fruit-fly ports	4,442

Horticultural imports:

	Parcels
Passed as free from pests	143,587
Fumigated	690
Refused admittance	389
Contraband destroyed	46
Total parcels horticultural imports for the month	144,712

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli, Pseudococcus sp., and *Ceramidia scintillocollaris* on bananas.
Chrysomphalus aurantii on oranges.

From China:

Lepidopterous larvæ in orange peel.

From Connecticut:

Pseudococcus sp. on gardenia.

From France:

Diaspis carueli and *Coccus hesperidum* on *Thuya*.

From Hawaii:

Diaspis bromeliæ and Pseudococcus bromeliæ on pineapples.
Chionaspis inday, Hemichionaspis minor and *Chrysomphalus aonidum* on cocoanuts.
Pseudococcus citri on pumpkins.
Coccus longulus on betel leaves.

From Japan:

Pseudococcus comstocki on persimmons.
Lecanium kunoensis (?) and *Pseudaonidia duplex* on plums.
Lepidopterous larvæ in dry wood.
Pseudaonidia duplex and *Leucaspis japonica* on persimmon bud wood.
Hemichionaspis minor on tangerines.
Fungus sp. on apples.
Hemichionaspis aspidistræ, Lepidosaphes beckii and *Hemichionaspis minor* on oranges.

From Mexico:

Chloridea obsoleta in tomatoes.
Lepidosaphes gloverii on limes.
Lepidosaphes beckii on oranges.
Parlatoria cinerea and *Lepidosaphes gloverii* on limes.
Coleopterous larvæ in sweet potatoes.
Chrysomphalus aonidum on pot plants.

From Nevada:

Heterodera radicicola in potatoes.

From New York:

Nematode root-knot on apple trees.

From Oregon:

Fungus sp. on onions.
Rhizoctonia and *Fusarium* on potatoes.

From Pennsylvania:

Diaspis boisduvalii on variegated pineapple.
Cerataphis lataniæ and *Pseudococcus nipæ* on *Cocos weddelliana*.

From Washington:

Pseudomonas tumefaciens and *Eriosoma lanigera* on apple.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	19
Fish boats inspected	2
Passengers arriving from fruit-fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	135,761½
Fumigated	47½
Refused admittance	17½
Contraband destroyed	10½
Total parcels horticultural imports for the month	135,836½

Pests Intercepted.

From Central America:
Pseudococcus sp. and *Aspidiotus cyanophylli* on bananas.

From Holland:
Lepidosaphes ulmi and *Saissetia hemisphærica* on boxwoods.

From Idaho:
Rhizoctonia on potatoes.

From Japan:
Agromyza schineri and *Pseudococcus* sp. on wistaria.
Pseudaonidea duplex on azaleas.
Pseudaonidea duplex and *Parlatoria* sp. on camellias.
Thyridopteryx ephemeræformis on daphne.
Hemichionaspis aspidistræ on *Aspidistra lurida*.
Pseudococcus sp. and *Cicada* eggs on persimmon stock.

From Kansas:
Pseudomonas tumefaciens on apple trees.

From Louisiana:
Aleyrodes sp. on jessamine shrubbery.

From Mexico:
Chloridea obsoleta in tomatoes.

From North Carolina:
Aleyrodes citri, Pseudococcus sp., and *Tetranychus mytilaspidis* on Cape jessamine.

From New York:
Green aphis on hibiscus.
Pseudococcus sp. on Cape jessamine plants.

From Texas:
Parlatoria pergandii on grapefruit.

From Wisconsin:
Pseudococcus citri and *Chrysomphalus aonidum* on Ponderosa lemon.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	17
Fish boats inspected	45
Passengers arriving from fruit-fly ports	7

Horticultural imports:	Parcels
Passed as free from pests	7,890½
Fumigated	0
Refused admittance	1½
Contraband destroyed	3
Total parcels horticultural imports for the month	7,895

Pests Intercepted.

From Idaho:
Rhizoctonia on potatoes.

From Mexico:
Chrysomphalus aurantii and *Lepidosaphes beckii* on lemons.
Diatræa saccharalis in sugarcane.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	4
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	12

RIVERSIDE COUNTY STATION.

Horticultural imports:	Parcels
Passed as free from pests	59
Fumigated	2
Refused admittance	0
Contraband destroyed	1
Total parcels horticultural imports for the month	62

Pests Intercepted.

From Kansas:
Nematodes on apple and pear seedlings.

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VOLUME VIII No. 6

MONTHLY BULLETIN

OF THE

STATE COMMISSION OF HORTICULTURE

"Headquarters for Convention Week"; The Mission Inn.

PROCEEDINGS

OF THE

First Interstate Vegetable Growers' Conference

RIVERSIDE, CALIFORNIA, MAY 26-31, 1919

HELD UNDER THE AUSPICES OF THE

State Commission of Horticulture

SACRAMENTO, CALIFORNIA JUNE, 1919

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AT

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46628

Bell Tower of the Mission Inn.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

Acceptance for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917; authorized August 27, 1918.

Vol. VIII. June, 1919 No. 6

VEGETABLE STANDARDIZATION.

Since 1915 both state and county horticultural officials have been interested in the enforcement of two standardization laws, one relating to the apple and the other to other deciduous fruits, as well as tomatoes and cantaloupes. In 1917 both laws were amended and the good work which was begun in 1915 was intensified after the amendments went into effect in 1917. Better laws which increased the powers of the county and state officials brought about a decided improvement. The purpose of standardization as provided for in these laws is to prevent deception in packing, to insure for the consumer a uniformly good article, and to benefit the producer by stabilizing prices. Since the enforcement of these laws began, there has been a vast improvement in the condition of all of our deciduous fruits with respect to the quality in the containers. Before standardization began great quantities of grapes, oranges, cantaloupes, apricots, plums, peaches, apples and other fruits were shipped before mature. This not only had a demoralizing effect upon the market but gave to the consumer an article which was not fit to eat in many cases. The improvement that has been brought about with respect to the fruits that are shipped into the markets of the country is now to be extended to vegetables, for under a bill which was passed by the last legislature, onions, sweet potatoes and potatoes must meet all the requirements that have to be met in the case of fruits. In

addition to the specific requirements laid down in section two of this amendment, it is made unlawful to prepare, sell or offer for sale a deceptive pack of fruits or vegetables, either fresh or in the dried state. Therefore, in the enforcement of the law which will go into effect about August 1, all fruits and all vegetables are included as far as deception in packing is concerned.

The vegetable growers have recognized the value to the fruit industry of standardization and have themselves requested that similar regulations be made to apply to vegetables. Last season the State Commissioner of Horticulture was asked to aid the onion growers in the Coachella Valley to enforce grading rules for their onions. In the absence of any legal authority some co-operative work was done. The results of the enforcement of voluntary grading rules, which were agreed upon by the growers, were more than satisfactory. Next year it will be possible for the State Commissioner of Horticulture to establish such grades and grading rules as the growers of any particular fruit or vegetable may desire, and the law gives him power to enforce any grades or rules thus established. It will be possible therefore in the case of Bermuda onion growers of the south to agree upon certain grades and requirements, and to compel all growers of onions to abide by them.

The co-operation of the vegetable growers and vegetable shippers in the state of California will do much toward aiding the State Horticultural Commissioner and the county horticultural commissioners in enforcing the provisions of this act. We know that this co-operation will be secured, and we have every reason to believe that in two years from now we can point to the work along vegetable standardization lines as being as successful as that which has been conducted with fruits. G. H. H.

VEGETABLE GROWERS' CONFERENCE BRINGS DEFINITE RESULTS.

For the first time in the history of fruit growers' conventions in California an extensive program for vegetable growers was planned in connection with the recent convention which was held at Riverside. The fact that vegetables as well as fruits are included under the terms of the new standardization law, and also the fact that it seemed necessary for the Western states to agree on uniform rules for the certification of potato seed, were responsible for the calling of this interstate conference. While there was a noticeable lack of vegetable growers in attendance, there was on the other hand a splendid representation of officials who are entrusted with the work of inspection for the certification of potato seed in a number of different Western states.

The potato seed certification question came in for a large share of the discussion during the conference. A special committee was composed of the following representatives:

E. P. Taylor, Arizona (Chairman),
E. R. Bennett, Idaho,
Mrs. Hilda B. Nielsen, California,
M. B. McKay, Oregon,

H. R. Hagan, Utah,
A. L. Strausz, Montana,
M. L. Dean, Washington,
Geo. M. List, Colorado,
W. P. Allewelt, U. S. D. A., Washington, D. C.,

For four consecutive days they worked faithfully for the purpose of agreeing upon a uniform schedule to be used in the certification work. Their efforts resulted in a special report, which is printed in another section of the bulletin, and which will undoubtedly be considered worth while by every one interested in the potato industry.

From the standpoint of California these rules have been given to us at a very opportune time. The last legislature amended the potato certification law, under which operations have been conducted since 1915, and the State Commissioner of Horticulture is now empowered to make his own rules and regulations for this important work. It is needless to say that he will copy closely after the uniform rules adopted by the members of the committee; in fact, it is believed that for years to come these rules will remain, possibly with slight modifications, the standard rules for certification throughout all the Western states. G. P. W.

View from Main Portal; Mission Inn.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

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DISCUSSION OF POTATO SEED CERTIFICATION SERVICE.

By M. F. BARRUS, Washington, D. C.

WHAT "GOOD SEED" MEANS.

The object of potato seed certification is to obtain good seed, that is, seed true to name, unmixed with other varieties, capable under good cultural conditions of producing a large crop of marketable tubers considering the characteristic conditions of the season and the territory in which it is grown. Seed to do this must have come from stock that has itself performed well and has presented the properties that we expect of its product. It must be free to a large extent of those factors, particularly those of transmissible diseases, that are capable of reducing the yield. Most of these are detected in field observations.

HOW GOOD SEED MAY BE PRODUCED.

To obtain such seed it must certainly come from fields of potatoes where vine growth is uniform, where there is a minimum of varietal mixture and of transmissible diseases, especially of such diseases as wilt, black leg, mosaic, and leaf roll. To determine this, inspections of the fields must be made by a competent person at least twice during the growing season, one about blossoming time and one before the vines die, and of the tubers at or after harvest. By a competent person is meant one who understands potato culture, potato varieties, and potato diseases. Such a person will be able to designate after making inspections what stock will make good seed and what will not.

There are many growers who would like to buy seed of this kind and would be willing to pay for it if they could be sure of getting it. There are others who are able and are willing to grow good stock for seed but are not able to establish the relationship with the buyer that they wish. The certification service is an effort on the part of some responsible organization or institution to determine what stock is good for seed and to mark that stock in some way so as to assure those who wish to purchase it that it is good.

ORGANIZATION OF SEED CERTIFICATION SERVICE.

Among the policies to be considered in the organization of a certification service may be mentioned:

(1) The assumption on the part of some responsible organization, commission or institution of the duties of a certifying agency. This may be a state department or commission, a state association of growers, or some organization especially formed for the purpose. Its duties will be in general, to ascertain who wishes inspection, to provide for it, and to determine what stock qualifies, issuing a certificate to the owners.

(2) The adoption of a standard for certifying potatoes by which a decision can be reached from the inspector's report of each lot inspected regarding its suitability for seed. This standard should be high enough to exclude all but first-class stock, but not so high as to make it impossible to certify any or only a

small quantity of satisfactory stock when more exists in regions where good stock can be grown. The standards should not be made so rigid that it is difficult to change it as needs require. As seed growers improve their stock the standard may be raised. They should not be so high at first as to discourage growers from attempting to grow good seed.

(3) The selection of tactful, competent, and honest men for inspectors. If more than one are needed, one of them should be made chief inspector and the other assistant. The certifying agency need not itself be directly responsible for the inspection work. It may contract with the College of Agriculture to do the inspecting, the reports on all fields and stock being turned over to the certifying agency as soon as the inspection is completed.

(4) The certification service should eventually be self-supporting. Indeed it will succeed better from the beginning if it is made largely so. If certification means anything, then placing the certifying tag on a bag of potatoes increases its value. They who are benefited by such service should pay for it.

(5) Each person receiving the inspection service and whose fields have qualified according to the standards adopted should receive a certificate of qualification from the certifying agency, such certificate bearing a serial number, his name and address, the acreage and name of each variety certified, and the condition of such certified stock respecting varietal purity, diseases, and yield as indicated by the inspector's report. On the back or elsewhere should be printed the standard adopted by the certifying agency.

(6) Each person receiving such a certificate should also receive a quantity of tags, the number being determined by the inspector, each tag being numbered serially and bearing on one side his certificate number, his name and address, and the variety of the potatoes, and on the other side the words "Certified Seed" and the name of the certifying agency with the name and address of its secretary. Thus labeled there is less likelihood of their being used improperly.

(7) The certifying agency should at the time the certificates are issued or as soon thereafter as possible publish a list of growers receiving them, with their address, and the varieties and quantity of certified seed each has for sale. Copies of these should be available to anyone upon request and they should also be distributed freely in all possible sections where a market may exist.

INSPECTION AT POINT OF SHIPMENT.

It is impossible at the present stage in the development of the certification service to inspect the seed as it is loaded for shipment. The certifying agency can determine whether a man's potatoes are suitable for seed according to the standard it has adopted, and it can issue only enough tags properly labeled to accommodate the amount of such seed he has. It must trust to his honor that he attaches these tags to the stock that is certified. However, it is not possible for him to palm off very poor stock more than one year if the buyer or planter makes complaint, for it is easy to check up from that end. The organization of local seed growers associations tends to do away with fraudulent practices for such associations are zealous that the stock sent out under their name will be as nearly perfect as possible to grow it.

IMPROVING SEED STOCK.

Good seed must be produced before it can be certified and there is a chance for much improvement yet. However, the certification service has in New York state done a great deal to awaken interest in growing good seed and I believe this will be the case wherever it is tried. Mosaic is the principal factor in causing rejection of white sprout stock. The growers are trying out new strains or varieties and as never before are maintaining seed plots. Such seed plots should be maintained by every grower applying for inspection or he should buy his seed each year

from some one who does improve his stock in some such way. Where local seed growers associations exist it is possible more quickly to produce large quantities of uniform high grade stock by having each member plant the same stock obtained from a single source where, of course, such stock is the best that can be had. One or two growers in a community best situated or best fitted to do so, can thus act as breeders or improvers of seed stock and the others act as propagators of it. However, here, we shall have to resort to each man maintaining a seed plot to improve his own stock for no one is willing to admit that he is inferior in his ability to other men or his stock in quality to theirs.

UNIFORMITY OF RULES AND REGULATIONS OF POTATO SEED CERTIFICATION.

By E. P. TAYLOR, Tucson, Arizona.

INTRODUCTION.

Standards are attained by first defining clearly what shall constitute the standard. The more definite that rules and regulations are made in establishing standards, as long as they are kept within practical working limits, the quicker these standards are attained.

That good crops come from good seed goes without saying, yet with Irish potatoes this statement has particular application, due to the tendency of this crop to degenerate unless great care is taken with the seed stock, and due also to the fact that a great number of diseases which beset the crop are carried on or in the seed.

REVIEW OF POTATO SEED CERTIFICATION WORK.

The first potato seed certification urged in the United States was that by W. A. Orton, plant pathologist, and Wm. Stuart, horticulturist, both of the United States Department of Agriculture.

The state of Wisconsin was one of the first states to take up the work. There it was initiated by J. G. Milward of the University of Wisconsin in 1914 and since has been constantly and successfully followed.

In California the potato seed certification movement dates from 1915, when from 2000 to 3000 sacks were certified according to the statement of W. V. Shear, then the federal potato expert working in this state.

In 1916 the writer, acting as Extension Field Horticulturist of Idaho, began seed inspection for certification, it being the first work of this kind undertaken in any Western state with the exception of the beginning made in California the preceding year. In Idaho in the year stated, 105 potato fields were given systematic inspections throughout the season. Of this number 15 were given certificates by the State Pure Seed Commission in the fall. There were 9600 sacks certified and the price received by the growers averaged for the state $1.45 per cwt., above the state average for table stock.

In 1917 the writer as a member of the Committee on Potato Seed Improvement and Certification of the Potato Association of America, assisted in the collection of data which showed that potato seed certification work was in successful progress at that time in nine states, including

Wisconsin, California, Idaho, New York, Maine, Vermont, Maryland. New Hampshire and Oregon. The report of Dr. M. F. Barrus, chairman of the above committee for 1918, showed that the pressure of war conditions had reduced potato seed certification work to some extent but that practically all of the states mentioned had maintained their certification plan and that 133,374 cwt. had been certified.

In Canada, Mr. Paul A. Murphy in charge of potato disease investigation, who has had charge also of the potato seed inspection and certification work, states that in 1918 five provinces, in which the work was done, produced 2237 cwt. of No. 1 certified seed.

That the opportunity for the extension of potato seed certification is great can be realized better when we consider that the total amount of certified seed produced in the United States last year would plant less than one per cent of the potato acreage of the nation. The benefits to the potato grower from the planting of certified seed are so apparent, however, that extension in the movement is inevitable. We have but to see the failures in potato yields due to poor seed to strengthen our belief. Professor Macoun, the eminent potato authority of Canada, cites variations in measured yields from 85 bushels per acre to 615 bushels per acre due to quality of seed.

Potato seed improvement has for its ultimate object the raising of the standard of shipments of the commercial table stock of potatoes and so potato seed certification has a broad significance, touching one of the greatest of our nation's food crops.

California is a great potato producing state. Ten to twelve thousand carloads of this crop produced last year in this state is a sufficient reminder that the potato seed problem is a pressing one. The recent passage of a new potato seed certification bill in this state makes it desirable that growers and officials charged with the administration of the new certification law discuss together at a conference of this kind, the details which must govern the successful operation of the law.

From the foregoing review of potato seed certification work in this and other states, it may be seen that some effective standards have been set and rules and regulations adopted which will be of assistance.

WHERE CERTIFIED SEED MAY BE GROWN.

Only those regions suitable for producing high class seed should be encouraged. California has a range of climatic conditions due to latitude and elevation that permits of great extension of certified seed growing. Soil already filled with potato diseases is ill suited for such an enterprise. "The most satisfactory results," says Eugene Grubb, the well known potato authority, "are obtained when seed is used that has been grown at high altitudes or at northern latitudes, or in coast valleys influenced by ocean breezes at low altitudes." In California such districts as Placerville, Butte Valley and other districts similarly located, should be able to supply ample certified seed for the needs of the delta of the San Joaquin and Sacramento rivers. For the planters of southern California, the higher elevations of the state will be able to supply ample certified seed in time. In the Flagstaff, Arizona, district on the foothill slopes of the San Francisco Mountains, under dry land conditions and at an elevation of from 6500 to 8500 feet, excellent seed potatoes are already being produced in sufficient

quantities to supply most of the needs of the planters of the warmer valleys of southern California and southern Arizona. Some districts will always be best adapted to seed growing and others to table stock. Where conditions will justify, a combination of the two will be possible.

GROW ONLY ADAPTED VARIETIES FOR CERTIFICATION.

Only such varieties as have shown themselves adapted to the region should be attempted for certification. The commercial varieties grown in the area to be supplied with certified seed will, of course, regulate the variety or varieties selected for certifications, provided these varieties are also adapted to the seed-producing area. Any one producing certified seed should not attempt more than three varieties at the most, or only one if the varieties are such as might easily be mixed in the bin. Such early varieties as Irish Cobbler, Bliss Triumph, Early Ohio and British Queen and later varieties, such as the Burbank, Russet Burbank, Rurals and Peachblow, will evidently continue in demand.

STANDARDS OF CERTIFICATION.

It is assumed that packages containing certified seed will always meet the general requirements now obtaining in the grading of commercial table stock under the United States potato standards circulated last year by the United States Department of Agriculture. To do this they must be "practically free from dirt or other foreign matter, frost injury, second growth, cuts, bruises or damage caused by diseases, insects or mechanical means, with no more than a three per cent variation by weight from any of the above details."

Since large potatoes are a waste for seed purposes, and smaller sizes are more economical, a smaller standard of size is desirable. In Idaho a two to a four-ounce seed is considered most economical. In Canada No. 1 certified seed to meet the federal certification requirements shall not be less than two ounces or more than twelve ounces, with a variation tolerance of five per cent. Size, however, is not a fundamental consideration in certification. Uniformity of size is more important on account of the use of commercial planters. We may say that there are but two classes of determinations to consider from the standpoint of the certificate to be granted. These are (1) varietal purity, and (2) freedom from disease.

VARIETAL PURITY.

Since mixture of varieties in seed purchased is one of the causes for loss, a rigid adherence to trueness to name should be followed. The economic loss of a grower from planting, for instance, a late variety when he wishes an early one is apparent. The increasing use of certain varieties of potatoes for certain purposes, such as for boiling, baking, etc., makes trueness to name a factor of increasing importance. Differences in dates of ripening, habits of setting of tubers upon vines, etc., are further factors favoring strict varietal purity. It is assumed that so far as possible, officials administering potato certification will encourage certification of only standard and tested varieties of the best types. Tubers having pointed ends should be avoided, as indicative of running-out of the strain. The most authentic and complete guide of potato nomenclature is probably the "Group Classification and Varietal

Descriptions of Some American Potatoes," by Wm. Stuart and published by the United States Department of Agriculture as Bulletin 176.

PESTS TO DISQUALIFY.

There are some potato diseases and pests which from their serious nature should, if present in the slightest degree, be considered cause for barring the potatoes from certification. Of these, of course, is the black wart or potato wart (*Chrysophlyctis endobiotica* Schilb.) which is one of the most serious diseases known on potato tubers. It is prevalent in parts of Europe and was known to occur in a few districts in Canada. It was for its exclusion from the United States that one of the first quarantine orders was issued under the Federal Quarantine Act in 1912. During the past year it has developed that the black wart disease of potatoes is prevalent in three counties in Pennsylvania and was probably in the country at the time the quarantine orders were issued. Its extremely local occurrence makes it desirable to keep a very close quarantine upon it.

Powdery scab (*Spongospora solani* Brunch.) also a very destructive disease and one under the ban of the Federal Quarantine Board, should be completely barred.

Potato eelworm (*Heterodera radicicola* [Greef] Mul.) in any degree should be cause for complete disqualification.

Tuber moth (*Phthorimaea operculella* Zeller) in any degree should also be cause for complete disqualification for certification. This pest, though prevalent and very destructive in some California potato districts, is not known to most potato producing states of the west, which accounts for the strenuous protests against the shipping of potatoes infested with tuber moth larvæ from California to adjoining states such as Idaho, Washington, Oregon, Arizona, Utah and other states.

REGULATIONS GOVERNING OTHER TUBER DISEASES.

The degree of infection from diseases of other kinds which might be considered permissible will vary with the disease. It will be found that in the different states varying degrees in percentage infection considered permissible on certified seed is to be noted. The following may be considered reasonable tuber infections at final inspection for California and other Western states:

(1) Common scab (*Oospora scabies*)—Not over 5 per cent and only small infections.
(2) Scurf or Rhizoctonia—Not over 15 per cent, with slight scurf spots on any single tuber and in no case spots larger than one-tenth inch in diameter.
(3) Vascular infection—Under this heading may be included such tuber infections causing wilt as Fusarium and Verticillium and black-leg (*Bacillus phytophthorus* Appel).

These are often spoken of as stem-end rots in the tuber. The average inspector in bin determinations will place them under the general classification of vascular infections. Not more than 5 per cent of the tubers should be permissible as determined at final inspection by cutting sections across the stem end.

Silver scurf should not disqualify stock for certification nor a slight amount of dry rot when manifestly the result of skin abrasions or bruises.

REGULATIONS GOVERNING DISEASES SHOWING ON VINE.

There are a number of potato maladies, some nonspecific, which can only be determined by an inspection of the vine during its growing stage, and which, though transmissible through the seed, are not discernible upon the tuber. Among these we may include:

(1) Mosaic—A nonspecific disorder but which is transmissible. The presence of 10 per cent or more vines at any summer inspection with well-defined mosaic should disqualify for certification.
(2) Curly dwarf—Not over 2 per cent well-defined "curly dwarf."
(3) Leaf roll—No certification if well-defined "leaf roll" infection is present. Allowance shall be made, however, for "false leaf roll' due to drouth, soil or other causes not transmissible through the seed.
(4) Spindling sprout—No seed from such plants and disqualification of field if 10 per cent of plants of field are affected.

GENERAL VINE CONDITION.

No certification should be allowed if at the inspection given at blooming time, more than 10 per cent of the plants show vine diseases from "wilt," "Black-leg" or early blight, or 15 per cent of all of these disorders combined.

At the second field inspection not more than 1 per cent of any one or more than 3 per cent of all combined will be permissible.

NUMBER OF INSPECTIONS AND METHOD.

At least three inspections should be provided. It is assumed that all growers of certified seed shall make careful selection of the seed stock to be used and will treat with corrosive sublimate or formaldehyde.

First inspection. The first inspection should be given at blooming time that mixed varieties may be detected from blossom differences and these rogued out in the presence of the inspector or a satisfactory guarantee made that such will be done. More than 5 per cent varietal mixture shall be considered sufficient to disqualify the plat for certification. The limits of vine diseases at this inspection are set forth under the preceding heading. Roguing of diseased hills shall be done at this inspection to the satisfaction of the inspector. At this inspection the inspector shall make a plot of the field showing relative location of seed plat in reference to the general field if only a portion of the field is to be certified. The inspector will find it convenient to give serial numbers to the places visited for inspection and to use a pocket size inspection blank with the principal points for observation printed thereon. (Samples attached herewith.)

Second inspection. This should be made before the ripening or freezing down of the vines. The inspection should not be delayed until the vines have ripened, frosted or died down, as the cause of condition may be impossible to determine. At the second field inspection roguing may be done under conditions laid down by the inspector, but if vine diseases enumerated under the paragraph "General Vine Conditions" exceed the 1 per cent of any one or 3 per cent of all combined, the plat or field shall be considered as not qualified for certification regardless of the elimination of undesirable plants by roguing.

Third inspection. This shall be made after harvest and preferably just before the tubers are loaded for market. The later the third or bin inspection can be made the better. The percentages of the different tuber diseases, such as scab, stem-end rot, scurf, etc., permissible for certification at the final inspection have already been given. At the time of the bin inspection a record of the yield for the seed plat or field can be taken and this data will furnish the grower valuable data which may or may not be included upon the certification card.

THE CERTIFICATE.

The tag of certification to be attached to each bag or container of certified potatoes should be printed on labels, attractive in color and style, with the name "Certified Seed Potatoes" in a conspicuous space at the top. It should contain the name and address of the grower, variety of potato and possibly the name of the inspector. The Wisconsin certificate states "that the said seed stock meets the prescribed standards relative to freedom from disease and varietal purity." It also states that: "This certificate covers only the acreage and crop herein described and is given upon signing of a statement by the above applicant that he has fulfilled all requirements made by the official inspector of his field and storage bins and that he will carry out the full intent and purpose of this certificate." The signature of the certifying officer should follow with the date issued. A signed statement of the applicant above referred to is secured for file by the inspector and the inspector also furnishes the grower a more detailed statement of conditions shown by the inspections.

A printed list of the certified seed growers in the state showing address and variety grown should be printed and distributed by the inspection department to facilitate purchasers in getting into contact with certified seed growers.

Growers and dealers will conform to the rules and regulations established for potato seed certification and will ask for such service as they see the benefits which follow. A certain latitude of administration is necessary for the certifying organization or officer so that varying and unforeseen conditions may be met. The inspection department will constantly require the assistance of the investigator of the State Agricultural College and the United States Department of Agriculture for the solution of new scientific problems which arise. The agricultural agent and the other Agricultural Extension Service workers will be valuable supporters of the certification plan legalized and administered by the inspection official, and they will demonstrate to farmers the practical application of the plan and bring about concerted action through educational methods.

POTATO CERTIFICATION IN CALIFORNIA.

By HILDA B. NIELSEN, Sebastopol, Cal.

THE INDUSTRY DEMANDS BETTER SEED POTATOES.

Conditions are such today, in the growing of potatoes, that our methods of raising them must be bettered, or we potato growers will have to find some other means of making our livelihood.

It may be noted in this regard that California is not the only state in the Union that is facing this problem—"the necessity of securing better and purer strains of seed potatoes"—which will do a great deal to overcome our yearly decrease in yields. Ohio, which is doing some splendid work along seed potato lines, has put out some very good potato bulletins. I will condense a few facts dealing principally with "Fusarium wilt," as being their most destructive potato disease, which they have to overcome.

Plenty of ventilation is necessary for successful storage of potatoes. Sick soil conditions may reduce the yield to 50 per cent or more of an average crop.

THE MINNESOTA CONVENTION.

In November, the potato growers of Minnesota held a three-day convention, and some excellent topics were discussed, among them being "Potato Certification" by Prof. E. C. Stakman, who very kindly answered my inquiry, but could not enlighten us very much.

Minnesota, with California, realizes present conditions are such that something radical must be done to save the industry, but this will be their first year in the putting of truly "state certified seed" on the market, they having been more successful in getting their appropriation to carry on the work than the California growers have been. On the other hand, there are a few California growers who have had considerable experience with growing of certified seed, through the kindness of our Horticultural Commissioner, Mr. G. H. Hecke, and the late Dr. A. J. Cook.

While we are sorry to learn that our Eastern and neighboring states are having serious trouble with their potato crops, through various fungous diseases and insects, their troubles should be a lesson to California, and we should not let our soils become infested with diseases, and should positively keep out the Eastern tourist insects.

EXPORT TRADE THREATENED.

California faces serious problems today in the raising of potatoes; with 40 per cent of our crop being exported, our neighboring states are justly up-in-arms over the quality of potatoes the California growers try to ship out. Idaho and Colorado have placed a ban on California potatoes; when Oregon finds it necessary to send a potato inspector, at their own expense to inspect our potatoes before leaving this state, our conditions surely must be deplorable. Truly, we growers must do something to change this condition.

Good, clean seed, in good, clean ground, and proper inspection of all potatoes shipped, both in and out of potato sections will revive our potato growing, and make it a profitable business. As it is now, growers in the Salinas section have been forced to turn to other kinds of farming, and other localities can tell the same story.

Certified seed means seed as nearly free from disease as it is possible to grow. We growers say with Emerson, "Hitch your wagon to a star," but while we may never reach the star, it is well at least to attempt it.

POTATO TROUBLES IN CALIFORNIA.

The principal diseases we have to combat in this state are, first, Rhizoctonia, as it causes the greatest loss commercially, and for this use only the corrosive sublimate dip, 4 ounces of corrosive sublimate and 30 gallons of water in wooden containers. Wooden barrels put up 15 or 18 inches from the ground, with a bung hole near the bottom. Have 2 or 4 barrels and use 1 or 2 in dipping; when 1½ hours of immersion has elapsed draw off water in under buckets and pour over potatoes in the remaining one or two barrels. Add one-half ounce of freshly diluted corrosive sublimate. This may be strengthened for four dips, then throw away and make a new solution.

Next in importance is the "fusarium wilt," a fungus which grows in the soil and causes rotting of potatoes both in the soil and in storage. This can be overcome by cutting off the stem end and keep on cutting until no discolored circle or spots are visible. In our own "British Queen" seed we have done this for eight years, until now, this last season, we could hunt and hunt and not find the least sign of it. Recently we examined 200 sacks that have not been touched since sorting time last November, and in a poor storage place, excellent overhead ventilation, and only found visible outward signs of fusarium wilt in two potatoes.

Then we have the tuber moth, with whom you are all too well acquainted for me to go into details, as well as the eel worm or potato nematode. Radical steps, I believe, should be taken to keep the eelworm within its present boundaries.

The decline in yield is due to "run out" seed stock, uncontrolled disease, the ravages of insect pest and poor stand. The upward trend will be possible through seed selection, disease control, and the united effort of growers in many sections to improve the crop, according to J. E. Larsen, of Oregon. This brings me down to my topic, which I dislike to discuss publicly; not because I do not thoroughly understand the potato certification question, but because I do understand it so very well, and have had more experience with it, within our state than any one else, and that is perhaps the reason this topic has been given me.

You will perhaps forgive me for getting personal, if I tell you that financially, to date, I do not consider the raising of certified seed potatoes a "howling success."

To meet this high standard which we have set for ourselves, means a great amount of detail work, which can not be accomplished with the ordinary hired man, and the buyer of today will not pay for the hiring of expert labor, even though they must certainly be convinced of the superiority of certified seed, over the average run of seed, which is mostly culls after the table stock has been sorted out. Our stock has been hill selected for eight years; as a result our average is increasing and we have cut our percentage of fusarium wilt and spindling sprouts to almost nil.

CERTIFIED SEED WILL PAY!

The average yield per acre today in California is 50 and 60 bags per acre. The average cost of the seed potato per bag is $2.00, which makes $10.00 per acre for seed. Certified seed at $3.00 per hundred would give you a cost of $15.00 for seed, with your average yield, putting it very low at 100 bags per acre, although it would be a poor grower who did not get at least 150.

I am not a very good arithmetician, but it is a poor grower who can not figure out the amount to be gained in using certified seed, but the difference in the dollars and the seed has failed to impress most of the growers that we meet with today.

One way in which California can maintain her reputation among the other states will be by the use of certified seed. Certified seed from seed of equal quality, in good, clean soil, (1) will put our potato growing industry on a paying basis; (2) put the California industry where it belongs, at the top of the ladder; and (3) create a lasting fellowship among our many Western friends and states.

UNIFORM RULES AND REGULATIONS FOR SEED POTATO CERTIFICATION IN THE PACIFIC COAST STATES.

By M. B. McKAY, Corvallis, Oregon.

INTERRELATION OF PACIFIC COAST POTATO PROBLEMS.

We are met here in part to discuss the advisability of having uniform regulations for the certification of seed potatoes in the Pacific Coast states whose interests in the potato industry are interrelated and whose problems in potato growing and particularly in potato disease control are largely identical. It is true that there are a number of local variations in the different areas but these are not of such magnitude as to necessitate fundamentally distinct methods in the solution of the problems. The matter of securing good seed potatoes is readily conceded to be the most important factor in potato culture, although by no means is it claimed to be the only important matter to be considered. The plan of official inspection and certification of potatoes is designed to locate and make available to the seed potato-buying public a supply of more or less standardized seed potatoes of good quality.

"GOOD SEED" REQUIREMENTS.

By the term "seed potatoes of good quality" is meant that they shall possess at least the following characteristics: Be satisfactory in size, true to type, unmixed with other varieties, free from serious diseases and blemishes, and able to produce high yields as indicated by past performances. It remains, however, for us to define these terms, or, in other words, to specify the limits of tolerance of the different diseases or the objectionable features which potatoes may contain and still meet in a practical way our conception of "good quality." We are justified in considering the standards required for certification in the different states as the definition of the term "potatoes of good quality" at least of the organization charged with the conduction of the certification work. It is worth our while to consider some of the points of difference in seed potato certification requirements as now in use in some of the different states. These are in part and briefly as follows:

SOME DIFFERENCES IN SEED POTATO CERTIFICATION REQUIREMENTS NOW IN USE IN DIFFERENT STATES.

Variety.

The use of standard variety names in classification is encouraged, and New York, Wisconsin, Oregon and California state that the tubers must conform to varietal type. All states insist on purity of seed stock before certification is made. New York and Vermont disqualify any field having more than 10 per cent of mixture with other varieties, Maryland and Oregon more than 5 per cent, and California more than 250 hills per acre, which is about 2½ per cent.

Size.

For most states the size limits are 2–10 ounces for early varieties and 2–12 ounces for late varieties, with 5 per cent tolerance either way. Wisconsin requires that "tubers must conform to such desirable commercial grades as can be secured through sorting." California includes

tubers of all varieties varying in size from 1¾ to 12 ounces. Oregon allows for the long varieties 2 to 16 ounces with not over 15 per cent over 12 ounces, and for the round and half-round varieties 2-20 ounces with not over 5 per cent over 16 ounces.

Cultural Conditions and Yield.

Most states require that a field in order to qualify must have had good culture, be comparatively free from weeds and give a satisfactory yield for the variety and season. California and Oregon have a rule concerning uniformity of yield.

Diseases and Insect Pests.

All states disqualify on the presence of wart and powdery scab. In addition California and Oregon disqualify because of the presence of eelworm and larvæ of the tuber moth. Maryland disqualifies because of eelworm, and Oregon includes *Rhizoctonia crocorum*, the violet alfalfa Rhizoctonia, as a cause for disqualification.

There is quite a variation in the amount of "wilt" permitted in the several states. Vermont and Oregon disqualify if there is more than 5 per cent in the field at any inspection, Maryland if there is more than 5 per cent at the second inspection and New York if there is more than 10 per cent at the first and 1 per cent at the second inspection. California and Oregon rule that after grading there shall not be over 8 per cent light infection of "wilt diseases" (Fusarium and Verticillium), and not over 2 per cent deep infection of "wilt," while Wisconsin covers "wilt" in the broad statement, "There shall be freedom from serious infection with any other disease."

Much less blackleg is permitted. Vermont disqualifies if there is 1 per cent at any inspection; Maryland if there is more than 5 per cent at second inspection; Oregon if there is more than 5 per cent at any field inspection; California if there are 50 infected hills in an acre, or in other words, about one-half of one per cent.

In regard to late blight, Oregon specifies that fields shall not be accepted if at the time of any field inspection a majority of the plants are killed or dying prematurely due to serious infection of the tops with late blight. Fields having late blight to a serious but not prohibitive extent shall be sprayed with Bordeaux mixture. After digging and grading the selected potatoes shall be practically free from late blight rot.

DISEASES OF UNKNOWN CAUSES.

The physiological diseases or diseases of unknown causes are assuming serious proportions in a number of potato-growing states. Opinions differ considerably as to how much of these troubles should be permitted in certification. In Vermont 5 per cent of any one or 10 per cent combined of the diseases known as "leaf roll," "curly dwarf," "mosaic," "fusarium wilt," or other objectionable diseases will disqualify a field. Maryland rules that seed stock shall be disqualified for certification for more than 5 per cent of hills showing the true "leaf-roll," "curly dwarf," and "mosaic" disease—any one or all combined at the time of the first inspection, and for the presence at the time of the second field inspection of more than 5 per cent of the hills diseased with any one or all combined of the serious diseases, "leaf-roll," "curly

dwarf," "mosaic," "blackleg" and "Fusarium wilt." California's ruling is that potato fields showing a mixture of more than 250 hills per acre (2.5 per cent) of other varieties, 500 weak hills (5 per cent) shall be disqualified unless such mixed, weak, or diseased hills shall be removed from the field. Oregon disqualifies the potatoes if at the time of any field inspection there are more than 5 per cent of the plants showing well defined "curly dwarf," "leaf-roll," "mosaic," "chlorosis," and other inherited weaknesses combined. New York fields may be disqualified for the following reasons: (1) The presence of more than 15 per cent "mosaic" at the first inspection or of more than 10 per cent at the second inspection. (2) The presence at first inspection of more than 10 per cent of either "wilt," "blackleg," "leaf-roll," "curly dwarf," or hills weak from other causes, or more than 15 per cent of all combined. (3) The presence at second inspection of more than 1 per cent of any one or of 3 per cent of all combined of the diseases just named.

After the potatoes are dug the following rules govern their qualifications, covering points not already given. Vermont, not over 10 per cent of the tubers shall show evidences of common scab and those not having deep pustules-tubers shall not show signs of rot, cutting or bruising. Maryland, seed stock shall be disqualified for certification for the presence at the final inspection of more than 10 per cent of the tubers with distinct spots of common scab or for any tubers showing deep scab pustules. For the presence at the final inspection of more than 5 per cent of the tubers showing distinct dry rot and deep browning at the stem end. California, after grading they shall be practically free from net necrosis or infection of late blight. They shall be free from serious infection of scab or Rhizoctonia, with not over 5 per cent light infection of scab or 10 per cent light infection of Rhizoctonia. They shall be reasonably sound and free from cuts and bruises or second growth. Oregon, the selected tubers shall be free from serious infection with common scab and Rhizoctonia. A small amount of light infection with either disease will not disqualify the potatoes.

INSPECTIONS.

A word might be added as to the number of inspections given. In most states three inspections are specified the first about blossoming time of the potato, the second near the completion of growth of the vines and the third after the potatoes are dug. In one or two states but two inspections are provided corresponding roughly to the first and third above enumerated.

The inspectors appointed are competent men who in most cases have had special training in plant pathology and in addition are familiar with potato varieties and potato culture.

ORGANIZATION.

It is interesting to note also what organization is conducting the work on potato certification in the different states though this is hardly a matter of study for possible unification on the part of this gathering here.

Wisconsin: College of Agriculture co-operating with Wisconsin Potato Growers Association.

New York: State Potato Association, assisted by staff of College of Agriculture as advisors.

Maryland: Western Maryland Seed Potato Growers Association issues certificates. Inspection done by Extension Plant Pathologist.

Vermont: Commissioner of Agriculture issues certificates on recommendation of Plant Pathologist of Experiment Station who has charge of inspection work.

Maine: Commissioner of Agriculture deputizes work to Seed Improvement Society.

Idaho: University of Idaho Extension Service. Inspection by Extension Horticulturist.

Oregon: Oregon Agricultural College, Extension Service; Associate Plant Pathologist, inspector.

California: Commissioner of Horticulture; Director, State Department of Agriculture.

This brief list of the requirements for certification in the different states shows a rather surprising uniformity in the standards when one considers the number and the varied interests of the different people who have been responsible for preparing them. It also indicates that it ought not be a difficult matter to secure universal agreement or one set of standards for all. No doubt some of the regulations now in force may be too liberal and probably also others are too strict for practical purposes at the present time. I believe that we should be able to agree on one set of regulations which may be used in all of our states and which, when the conditions are met, will give us seed potatoes of "good quality" as defined above. Any potatoes which possess these desirable qualities mentioned would be good seed potatoes in not only one but in all of our different states, provided of course the variety was adapted to the climate, market demand, etc. These latter features have to be considered, of course, aside and distinct from any plan of certification in use.

ADVANTAGES FROM STANDARDIZED PRODUCT.

In this discussion I have not dwelt on the advantages to be gained from having a more or less standardized product which might be freely exchanged or recognized between the different states interested, but rather have I dwelt on the possibility of securing standards and regulations which could be uniformly adopted in our different states.

I believe that a committee consisting of possibly one person from each of the states represented here and interested in this subject should be appointed to draw up a set of proposed uniform rules and regulations for potato certification. This committee should be requested to report back to the meeting tomorrow so that there may be free discussion of whatever plans are formulated with a view to the recommendation on the part of this body of their later adoption in the different states concerned. It seems to me that this committee should be charged also with the duty of suggesting the formation of a more or less standing organization for handling matters concerning potato certification in the future and providing for amendments to the uniform regulations if adopted, the necessity for which will undoubtedly arise as conditions change.

STANDARDIZATION IN IMPERIAL COUNTY.

By F. W. WAITE, El Centro, Cal.

HOW THE LAW WAS AIDED.

The state standardization law went into effect on August 8, 1915, and in order to get the benefit of this law in the Imperial Valley for the cantaloupe crop of that year it was necessary to enlist the co-operation of the growers and distributors. After communicating with the distributors, a meeting was called, which took place before the season opened. It was agreed that all co-operate with the horticultural commissioner and get the benefit of the new law. The results were a great success, and proved very beneficial to the industry. The standardization law has been enforced each season since becoming effective, and the results are satisfactory to all, and with a continued increase in acreage the profits have likewise increased.

CANTALOUPES IN IMPERIAL, 1919.

This season (1919) there are 14,000 acres of cantaloupes in Imperial County, and 352 carloads have been shipped in one day, the highest record known. For many days over 300 cars have gone out daily. Imperial County produces one-third of all the cantaloupes in the United States. Since the first law was enacted in 1915, changes have been made which have improved the law, as well as adding other farm products. Tomatoes one of the most important in this valley. It will not be many years hence before all farm products will be standardized.

CO-OPERATION OF GROWERS IMPORTANT.

The growers realize the great benefit of standardization and inspection and co-operated this season to the extent of assisting in the extra expense of paying inspectors' salaries. The cantaloupe distributors have always contributed in carrying on the extra cost of inspection, and co-operate with this department in every way possible. Those acquainted with the cantaloupe industry in this valley realize the importance of picking melons at the proper time; being properly packed, inspected, delivered to the railroad, and loaded. To handle over 300 cars daily is no small undertaking, and yet it has been accomplished, due to a system working like clockwork. In order to obtain a uniform pack of melons, to comply with the law, it is necessary at times to condemn loads of cantaloupes, which must be repacked or held at the shed until unfit for shipment. The disposition of condemned food products is a serious problem. It is necessary for some violators of the law to sustain a loss in order to realize the importance of obeying the same. It is also a matter of education on the part of the growers, when they will appreciate the benefit and be willing to comply with the law.

INSPECTION IN IMPERIAL VALLEY.

In the inspection of cantaloupes it is always agreed to begin picking on the "fullslip" and continue for a week or ten days. All melons not "fullslip" are counted as green, or immature. As the season advances it is necessary to "get away" from the fullslip, and make a forced slip. At the last annual meeting of the distributors, it was voted to

eliminate the word halfslip. When any of inspectors or distributors gave the word to the pickers to pick halfslip, it was difficult to keep them from picking the vines and all. A picked melon is either a "full-slip," "forced" or "break." In the enforcement of the law the inspectors determine whether the melons that are packed and offered for sale or shipment are mature. Green melons in the crates condemn the lot. No per cent is allowed. To allow any percentage of green melons would make an endless amount of trouble.

STANDARDIZATION OF THE VEGETABLE PACK DESIRABLE.

By F. B. REYNARD, Los Angeles, Cal.

THE NEW LAW.

Senator Inman's standardization bill passed by the recent legislature states as its purpose to promote the development of the California fruit and vegetable industry by creating standards and standard packages, and providing for their enforcement. We have had a standardization law covering fruits and cantaloupes, but the Inman Act adds the standardization of vegetables, which is new, and opens up an interesting and important field of activity.

NEED FOR VEGETABLE STANDARDIZATION.

To those familiar with the history of cantaloupe growing in Imperial Valley, it is needless to point out the important part played in its development by standardization, and by the co-operation of the county, state and federal authorities with the producers and distributors. The working of the standardization law also seems to have been satisfactory in the fruit industry, and while it is probably true that fruit and cantaloupes lend themselves easier to regulations than will all of the miscellaneous lines of vegetables, at the same time, the same opportunities exist for betterment in the vegetable industry as have been successfully worked out in the fruits and cantaloupes, and for which success due credit should be given, not only to the standardization regulations themselves, but to the cordial and sensible assistance rendered by those in charge of their enforcement, and the broadminded co-operation given towards the solving of the problems by the growers and packers.

VEGETABLE PRODUCTION AN ASSET.

The vegetable production of the state, while it is not as large as the fruit production, is still a business of real importance. Without attempting to quote lengthy statistics, the records show net returns to the growers for vegetables shipped out of the state will average annually between 20 and 25 millions of dollars on from 35 to 40 thousand cars of celery, cauliflower, lettuce, cabbage, tomatoes, potatoes, onions, cucumbers, rhubarb, artichokes, peas, asparagus, etc. These figures do not include production for local use or for canning purposes.

In the packing and marketing of these vegetables some bad practices have arisen. It could not be otherwise under the absence of regulations and considering the intense competition, together with the fluctuating

crop and market conditions, the difficulties arising at times from shortage and poor quality of labor, and the lack of facilities. In the correcting of these conditions, standardization measures and the co-operation of the state authorities with the producer and packer are bound to help. During the two strenuous years just past a great deal of regulatory work has been done by the various branches of the government, including the Food Administration, the Bureau of Markets and the Bureau of Chemistry. Also national trade organizations of shippers and distributors are earnestly working towards rules and regulations among themselves to create clearer understandings, better service to the producer and consumer, and the elimination of waste. An important link in the entire chain is the standardization of packages and grades, and the importance of this particular link has become so evident that state standardization of vegetables is the logical result.

These new regulations should, and no doubt will, give due consideration to every factor interested, starting with the producers, including the packer, the shipper, the box manufacturer, the carrier, the jobber, the retailer, and the consumer. In the practical solution of standardization measures it probably will not be possible to establish special grading rules for certain lines of vegetables which are subject to great variations in size, quality and condition throughout the season, and which are grown under numerous and different conditions of soil, climate and location. For such lines the requirements of sections 2 and 14 of the Standardization Act may be the limit of regulation, but as these sections provide for such essentials as reasonable uniformity of quality and size throughout the container, and prohibit deceptive packing, they will doubtless be ample to fairly safeguard the interests of all.

Other lines of vegetables that can be definitely classified as to locality, season and variety, may need special grading rules, and section 3 of the Standardization Act is constructed to meet such conditions. It provides a way to establish standard grades and packages when needed for a certain product in any locality and for that particular season, by conference of all interested with the Commissioner of Horticulture. Doubtless this arrangement will accomplish good results in several important sections where large movements of vegetables are originated every season and where the need of co-operation with the state authorities has been felt in the past, but not available under the existing legislation. It certainly is the logical method of getting the standardization movement under way and establishes the producer's position in its promotion in a manner that gives him full measure of protection. It might be pertinent to call the grower's attention here to this advantage, and urge his co-operation, for it is a surety that if he neglects his interests in the establishment of these standards, others will do it for him.

STANDARD CONTAINERS.

Standard containers for vegetables, if I may venture an opinion, have been too long neglected, and there is urgent need of prompt action in establishing them. Take lettuce as an example. In Los Angeles last season many disputes arose between growers and shippers from the fact that lettuce was bought and sold by the field crate. There was no standard content of a field crate and disputes were inevitable. There were also numerous sized packages used by distributors for Eastern

shipment. As lettuce is sold by crate, it follows that the buyer and seller can deal more satisfactorily if a standard crate is established. Disputes mean waste, as lettuce can not be kicked around at loading point or at destination, pending settlements of differences, without suffering injury or loss. The disputes can be lessened materially by clearer understanding between buyer and seller, and a standard package is surely a means toward a clear understanding. Standard dimensions for containers doubtless would suit the box manufacturers and carriers better than a lot of odd sizes.

It is my understanding that at the insistence of the railroads, conferences already have been held with producers, shippers and box manufacturers, and that certain standard specifications for packages will be agreed upon which doubtless will be satisfactory standards as far as they go for the state to officially approve and enforce. In the establishment of standard crates, however, due consideration should be given to supplies on hand, and opportunity made for their use prior to the enforcement of the standard regulations. Also, different crates may be required for the same product in different districts.

SUCCESS DEPENDS UPON DEGREE OF CO-OPERATION.

In conclusion, I again suggest that the success or failure of vegetable standardization in this state will depend largely upon the extent to which the vegetable interests of the state co-operate with the Horticultural Commissioner, and this new legislation places a considerable responsibility upon the grower as well as every other interest affected, if for no other reason than their own interest, to co-operate with the officials in the development and enforcement of the new law.

TOMATO STANDARDIZATION.

By FRED C. BROSIUS, Sacramento, Cal.

In the formation of the "Fresh Fruit Standardization Law" in 1915, tomatoes were not included, but in 1917 the author of the revised standardization bill, Assemblyman George Ashley, incorporated them in the law at the urgent request of growers and shippers from all parts of the state.

This was intended as an entering wedge for vegetable standardization, and I believe that the proponents have not been disappointed, for the tomato pack has been so improved during the past two years, that in the revision of this law during the late Legislature, other vegetables that are possible to standardize have been added, such as sweet and Irish potatoes, onions, and also nuts.

A STANDARD TOMATO PACK.

Three main reasons were advanced in favor of a standard pack for tomatoes and briefly are as follows: First, uniform quality and maturity; second, practical uniformity in size; third, elimination of worms and other serious defects.

When we first began our inspection of tomatoes in the fall of 1917, the following condition was found to prevail in the average pack: 20 per cent red to overripe; 30 per cent pink to red; 50 per cent green to straw.

This enabled the consumer buying a full box to eat part on July 4, part in September and the balance about Thanksgiving time.

However, the retailer who was selling to the trade from the box did not wish to carry his stock for so long a period. In order to overcome this deplorable condition, the buyers in our vicinity placed their orders on the color basis about as follows: First, green; second, straw; third, pink; fourth, red. This enables the growers or packers to grade to a color standard for maturity, which is working out very nicely.

The second reason advanced, "practical uniformity in size." In the average pack, either in the basket, peach or lug box, one could generally obtain any size desired from as large as a dinner plate to one that could pass through a finger ring. I have often counted on the top layer of a two-tier pack, 24 to 30 fine, large, perfect specimens, while on the bottom layer there would be 40 to 56, often inedible culls, hardly fit for human consumption. In reality the buyer bought a two-tier pack to obtain the top tier, as it was about all he could possibly use. I have often found them to vary in size from 15 to 61 per cent in a crate.

In our peach box and Los Angeles lug pack we now insist upon no greater variation than four tomatoes between the top and bottom layer, or not over a three-eighth inch variation throughout the container.

WORMS AND OTHER DEFECTS.

Many shipments inspected during the past two years show an infestation of worms varying from 2 per cent to 60 per cent, and is a practice that should absolutely not be tolerated. I believe that the average consumer would rather order his meat from the butcher, and again deterioration occurs quicker from this cause than any other, except sunburn and splitting, which should also be eliminated from the pack.

Following is a record of a few lots condemned from outside points in Sacramento County during the past season:

Total boxes or crates	Variation in size	Insect infestation	Color and maturity	Loss in repack
20 crates	61%		Green and red	12 crates
15 crates	61%	2%	Green and red	
1000 crates	30%	8%	Red to overripe	165 crates
1000 crates	30%	8%	Red to overripe	120 crates
1000 crates	30%	5%	Green to ripe red	162 crates
1050 crates	30%		Green to red	159 crates
250 peach boxes	30%	2%	Green to ripe red	120 crates
210 peach boxes	50%		Green to overripe	[1]58 crates
252 peach boxes		12%	Green to ripe red	40 crates
15 peach boxes		60%	Rotten and sunburn	[2]15 crates
16 peach boxes	35%		Pink	[3]4 crates

[1]Top, 30; bottom, 56. [2]Dumped. [3]Top, 33; bottom, 50.

In conclusion, in all lines of the fruit industry, the grower is realizing that it pays to put up a high-grade standard pack and to keep his culls off of the market, working them into a by-product. The same is absolutely true of tomatoes.

A standard pack along the lines herein described is an honest pack, which will certainly reward the growers and packers with an honest profit.

THE BEST CONDITIONS FOR POTATOES.

By EUGENE H. GRUBB.

ALFALFA FIRST.

Alfalfa is the natural forerunner of the potato, in that it affords an extra supply of nitrogen and humus and aids very materially in loosening up the soil to permit of ready aeration. The mineral plant foods, with rare exception, are already abundant in practically all our Western soils, and when the effect of two or three years of alfalfa growing, combined with the turning under in the fall of the last crop is added, an ideal seed-bed for production of the Irish tuber is in the making. In order to subdue alfalfa for a crop of potatoes the following season, it is very essential that the alfalfa be crowned in the fall—that is, plowed about three inches deep. This exposes the crowns to winter freezing and thawing, thus killing most of them. Any that are still alive in the spring can be easily killed when the land is again plowed, but this time to a depth of from eight to ten inches. The deeper the better.

DEEP PLOWING.

Deep plowing affords an excellent storage reservoir for spring precipitation, increases aeration, and leaves the ground in a loose, friable condition, at the same time puts the alfalfa crowns down where they will not cause trouble in cultivation and puts them where they will readily decay and be incorporated in the soil, thus making plant food readily available. After this deep plowing, the land should be worked down and pulverized with a disk harrow, or similar effective implement, then harrowed and floated. Potatoes, or pieces of potatoes, when planted, will sprout without moisture, but they will not root unless moist earth touches the seed-piece.

THE SEED-BED.

A proper seed-bed, therefore, is one which among other things contains sufficient moisture to cause the potato to root. Summer fallowing, fall plowing, spring plowing and additional tillage and irrigation in spring before plowing or even in the late fall are all means of obtaining this desirable condition of the seed-bed. Decayed vegetable matter incorporated in the soil is the best moisture storage reservoir that can be produced and, in addition to that, it adds very materially in loosening up the soil, thus permitting ready air penetration.

FERTILIZING.

Care should be taken in supplying manure, however, when it is intended to improve the potato crop in order to thoroughly incorporate it into the soil before the seed is planted. Otherwise excellent conditions are afforded for the growth and reproduction of disease germs affecting the tuber. The fall plowing of green manure crops or of land manured in the fall has been found satisfactory in our old potato-growing sections. The potato is a deep-rooted crop and must form its tubers well beneath the surface and it therefore requires a deeper, looser, more porous seed-bed than do any of the grain crops.

DRAINAGE.

Hence, for uniform, perfect development, there must be a constant supply of air, moisture and available plant food. Potatoes will not grow successfully in water-logged, marshy, undrained, cold or sour soils. On irrigated land good drainage must be secured. Artificial drainage can sometimes be made effective. In heavy soils porosity and necessary aeration can be obtained by the addition of green manure alfalfa, or barnyard manure. It is essential to have soil that will not run together and bake, and that rain does not compact and firm so that the tubers can not readily and uniformly enlarge in order to develop a smooth, shapely, uniform and firm potato.

If the foregoing methods are used in California, it will produce potatoes with a beautiful transparent skin, with luster like the bloom of an apple that is grown in the sunshine, which makes them very attractive to the eye and to the purchaser. If they are also grown in this aerated seed bed, they will be more healthful, of better quality and flavor and of higher food value.

PURE SEED.

If to the above is added the use of pure and healthful seed potatoes grown under the supervision of the "Pure Seed Potato Law" under the provision of Geo. H. Hecke of California, the products will be doubled per acre, the profits of the grower thus enhanced at a very small increase of the cost, and will give to the consuming public a much lesser price than heretofore.

THE EFFECT OF GOOD SEED ON THE VEGETABLE INDUSTRY.

By E. R. BENNETT, Boise, Idaho.

GOOD SEED DEFINED.

"*As ye sow, so shall ye reap.*" The truth of this text is universally accepted in theory and has been since the dawn of history. In practice, however, many growers either fail to grasp its truth with its full force or believe that congenial growing conditions can be made to overcome the influences of heredity in seed.

To discuss this question intelligently, we must first define what is meant by good seed. Good seed from the grower's standpoint is seed of a given variety of a particular species of vegetable that is unmixed in variety, of good viability from high yielding healthy plants, true to type of the given variety, and free from the influences of pollinization from other varieties or undesirable strains of the same variety. All these characters are invisible and so intangible that it is easy to forget their importance and to trust to luck in securing seed stock for planting.

By far the larger part of the experiments and literature on the subject of gardening pertains to the culture—environment, rather than to the heredity of the plants with which we work. To say which of these two factors in truck growing is more important is to bring up the perennial question of heredity versus environment. Any one who cultivates a garden realizes the necessity for providing the proper fertility, moisture,

etc., in order to make plants grow successfully. That intangible something which every seed contains has been carried from generation to generation, and which determines whether the flesh of a cantaloupe will be salmon color or green although not seen in the seed, is of vital importance to the grower.

HEREDITY IN SEED.

All our garden vegetables have their prototype somewhere in some wild species from which they have, by gradual changes or improvements been derived. Great changes in the nature and habit of the various species have been thus brought about. With some vegetables, as the tomato and celery, these changes have been largely brought about within the memory of men now living. Others, as the onion, have been known practically as they are now, for many centuries. In making these changes in the habits of the plant we have developed a great multiplicity of forms. The tomato is one of the best examples of this. In this vegetable we have not less than 100 distinct varieties, including at least three distinct colors and a great variation in size and shape of fruit as well as season of growth and time of ripening. As a corollary to this development in forms of vegetables, we have the tendency in the seedlings to revert toward some original form or break up into new forms. This we find admitted by seedsmen when they speak of "fixing a type" of vegetable. The fact is that a type of these vegetables that have many forms is never fixed, but on the contrary the types are continually giving way to new forms or improved strains. The causes underlying these changes are, at least to a certain extent, fundamental, that is, they are the same as other phenomena of evolution which is a natural phenomena or plan of improvement that can hardly be explained. Climate and crossing are also factors in inducing changes in types of plants. We have found new varieties of melons that appeared fairly constant or fixed in one place, but when the seed was taken to a different district the type broke up entirely. A further discussion of this phase of the subject is unnecessary, as this is sufficient to indicate the complexity of the seed producing industry, hence the importance of seed to the grower.

CROSSING OR MIXING.

One of the most common difficulties in preventing the deterioration of a strain or variety is the ease with which many vegetables cross with other varieties. This crossing in the hands of a gardener who has the necessary discriminating ability to select a desired type is a fruitful source of improvement, but to the ordinary gardener it creates a confusion of forms that is bewildering. To the amateur the greatest difficulty in keeping his varieties pure is that the cross in most cases does not show till the second generation. Again, constant roguing (culling) is necessary to maintain a type in most vegetables. Because of these factors most seedsmen are skeptical of the value of garden seeds grown and offered for sale by the everyday farmer or gardener. From personal experience the writer has come to the conclusion that but few farmers or gardeners understand the problems of seed growing sufficiently to attempt to even grow seed for their own use of many of the common vegetables, and growing seed for the trade by these men is of much more doubtful expediency.

SEED GROWING A SPECIALIZED INDUSTRY.

Vegetable seed growing is becoming more and more a specialized industry. Most vegetables can be grown more or less successfully in all climates. We are finding, however, that the seed for these vegetables can not be produced to advantage in many districts. Some sections of the country are better adapted to the production of seed of at least better appearance and in most cases seeds that are easily produced in those districts can also be produced at a better profit than in less congenial districts.

ACCLIMITIZATION OF SEED.

While there is no question that the tendency has been and still is toward the centralization or localization of the production of most garden seed, we, personally, are not so sure that for the careful vegetable grower who aims to produce the best and highest yielding crops, this system gives the best results.

There is a belief among growers that seed produced in high latitudes or high altitudes—short season districts—matures a crop in less time than from seed grown in long season districts. We have been unable to find satisfactory proof that this idea is strictly based on fact, yet there is some evidence that the environment under which seed is grown does affect the crop. A few years ago we had an opportunity to compare two plots of the same variety of onions in Colorado. One was grown from seed purchased from one of our most reliable seedsmen in the East, while the other plot was planted with local seed. The difference was quite marked. The local seed produced bulbs of about the same size as those from the Eastern seed, but the crop matured fully ten days earlier. This, however, does not prove anything, for we had no way of proving where the Eastern seed was really produced nor from what source the Eastern stock seed originated.

In the majority of cases it is undoubtedly far cheaper for the gardener to buy his vegetable seed than to attempt to grow it. It is probable, too, that the average garden seed sold by seedsmen is from better stock and more carefully rogued than is home-saved seed. Notwithstanding this fact, it is believed there are great possibilities for improvement in crops for the man who understands plant breeding in growing his own seed. One of the large market gardeners of New England, who grows his own onion seed, told us that he could buy the seed for less than half the cost to grow it, but that because of the uncertainty as to the variety and quality of seed bought, he did not care to take the chance.

A more recent case is still more to the point. A gardener in Idaho with whom we have been in rather close touch, experienced a very severe loss last season from securing poor seed. One and one-half pounds of cauliflower seed was planted on about two acres of ground. The plants started well but soon began to diverge in type and habit of growth. We saw this field in early August. At that time the grower had great hopes of a profitable crop, although we called his attention to the fact that the plants were not uniform and at least a large percentage of them were offtype. Later we were called upon to make a written statement as to the conditions as we saw them. The crop eventually not only proved to be offtype, but was a total loss, as there was hardly

a head of cauliflower in the whole field. The seed alone cost $75 and this was only a small part of the loss as the crop was expected to bring at least $1,000 per acre, which it would have done had it been high grade snowball cauliflower as represented. This case may have been the result of an error, but it looked much more like crooked work somewhere along the line, as the product of the seed ranged all the way from cauliflower through Brussels sprouts and cabbage to kale.

In such cases there should be some way of fixing the responsibility and punishing those guilty of the fraud. As it is practically impossible for the gardener to produce his own cauliflower seed, the only safe procedure is to secure such seed from firms who are reliable and responsible in case of mistakes.

The field for improvement in vegetables is very broad. Even though the seedsmen's products are standardized so as to hold the type of the vegetable, the result is after all but a general average. A general average means good, bad and indifferent. Big gains would result if the bad and indifferent could be eliminated. Only the best types and perfect plants should be used as mother plants. These are not necessarily the largest plants nor those that produce the most fruits. The best plant is the one that carries with it that vitality which enables its offspring to resist disease, and reproduce the good qualities of the parent. How far this can be carried at present is not known. After we eliminate the undesirable types we may be able to still improve the remaining good types. There is, however, necessarily a limit to this building-up process. We are prone to forget some of the fundamental principles involved in agriculture. All of our agricultural crops and probably all of our domestic animals as well are in one sense artificial products. They have been bred and selected to secure certain results. These results are in most cases at variance with nature. In other words nature's aim is to produce as much seed as possible that reproduction of the particular species may be abundant. We have changed the habit of the animal or plant and selected to get some particular function or part of the plant or animal to develop abnormally. As an illustration, the primitive tomato plant that had a great number of small inferior fruits with many seeds was a better plant from nature's standpoint than is the Ponderosa of our time with its almost seedless fruits that weigh in the neighborhood of a pound. We are paying the penalty for our work with our so-called improvements in getting a lessened resistive to disease and a weaker constitution. We are also getting a greater tendency toward what we call "running out." What the final outcome of this variance with nature is to be, no one can say. We are not prepared to recede from our efforts to at least keep up the present standard of our vegetables and fruits, but we must realize that there will some time be a limit beyond which we can not go.

AGE OF SEED.

Not infrequently growers attribute crop failures to the age of the seed sown. For many years we have been told by gardeners that the tendency of root crops to go to seed the first year was due to the fact that the seed sown was old—meaning that it was more than one year old. We have found no evidence that this is necessarily true. In the case of celery our experience has been that failure to make a crop or

seeding was more likely to be the result of poor cultural methods. A check in the growth of the plants will induce celery to seed and the same may be true of the root crops also.

There is no question but that the age of seed is an important factor in successful gardening. We believe, however, that this is largely a matter of viability. Many vegetable seed will fail to grow when more than one season old, and possibly some of those that do grow may be so weakened as to fail to produce as would fresh seed. It is a peculiar fact that some species that it would seem should retain their vitality will become worthless after one season, while other seemingly more tender plants retain their viability for long periods. The onion seems to hold the record for inability to retain life while the cucurbits may grow even after a lapse of eight or ten years. Some of the weeds, as lambs'-quarters, were known in one experiment to retain their viability after being buried seventeen years.

TEST SEEDS.

Unquestionably the safe plan for the grower is to use only such seed as is known to be new or at least this system should be followed so far as is possible. Every gardener realizes the importance of good seed and there seems to be a growing tendency among the better growers to produce their own seeds so far as is practicable. Where this is done intelligently with a view to improving the variety or strain, the work is undoubtedly profitable. We will hardly be able to dispense with the professional seedsman, however. It is to him that we must look for the greater part of the seeds used as well as for much of the standardization and improvement of our vegetable crops.

VEGETABLE SEED IMPROVEMENT.

By S. S. ROGERS, Davis, Cal.

GOOD SEED AS AFFECTING YIELDS.

The planting of good quality vegetable seed has always been considered one of the most essential influences affecting the value of the crop. During the past decade interest in the proper selection of seed has continually increased until at the present the thoughtful and successful grower considers this to be of first importance. Good seed true to type means larger yields of high quality crops with a corresponding larger net return per acre than when seed of poor quality is planted. It may therefore be readily understood that the initial cost of the seed is negligible as compared to the quality.

SEED QUALITY DEFINED.

In speaking of the quality two conditions are meant: (1) germination; (2) the strain trueness to type or pedigree. There are two methods for seed improvement, crossing or hybridizing and by individual plant selection. The former method is more or less uncertain and requires considerable time, experience and effort, while the latter is much easier and may be successfully carried on by those who are careful and consistent.

The question of hybridizing will not be considered at this time, but a few of the more important points upon the subject of seed selection might be of interest.

SEED SELECTION.

The first and most important consideration is to have a definite object or ideal to select to. This may be higher yields, better quality, degree of earliness of maturity, uniformity of size, color, etc. In considering the above points, the demands of the market must be met as closely as possible. It is also essential that the selection be carried on by the same person and a written description of the ideal should be made in detail in order that the work may be carried on systematically.

If the selection has for its object the continuation of a certain variety of vegetables, such as the Los Angeles lettuce, Stone tomato, etc., the characteristics of the variety together with the improvement should be carefully studied. In order to keep the strain from deteriorating, continuous selections are necessary from year to year, for unless this is done the strain will break up and more or less inferior plants will be present.

It is always best to select to one principle quality, but oftentimes it is possible to improve other conditions at the same time. This, however, should not be done at the expense of the main object of the selection. As an example, in selecting tomatoes for earliness, it will undoubtedly be found that a number of plants come into bearing at the same time, which gives an opportunity to choose from these the ones which bear the best quality product. This choice, however, should under the above conditions never be made at the expense of earliness.

In selecting such crops as tomatoes, melons, etc., the character and quality of the entire crop on the vine should be considered and not that of the individual tomato or melon. In selecting for earliness it is not necessary to save for seed the first individuals to mature, but those vines which are chosen for their earliness should be marked before harvesting starts. In the selection of such crops as lettuce, cabbage, beets, etc., the individual plants should be considered.

To summarize the principles of seed selection, the grower should know before the selection is made what he wishes to attain and in the choice, the demands of the market should first be considered. One should endeavor to confine the selection to one principal object and a written description should be made. Continuous selections should be made each season, and where possible the work should be performed by the same person.

REPORT OF COMMITTEE ON UNIFORM RULES AND REGULATIONS TO GOVERN CERTIFICATION OF SEED POTATOES.

Vegetable Growers' Conference of Fifty-first Fruit Growers and Farmers' Convention, State Horticultural Commission, Riverside, California, May 26 to 31, 1919.

The committee appointed for the formation of a system of uniform rules and regulations, governing the official certification of seed potatoes in the Western States, hereby submits the following report for consideration:

WHEREAS, The Irish potato is one of the great food crops of the country; and

WHEREAS, The yields per acre are materially reduced by the use of poor seed stock; and

WHEREAS, The work of improvement of seed stock through official certification in the different Western States has been carried on without attempt at co-operation between the certifying authorities of the several Wesern States; and

WHEREAS, The market and demand for certified seed potatoes extends over this entire territory, we, the committee, believe that the potato seed industry and the potato industry, as a whole, will be greatly improved by the adoption of an acceptable uniform system of certification of seed potatoes in the Western States.

STANDARDS FOR CERTIFICATION.

It is understood that potatoes for seed certification should first conform to the general standards governing "U. S. No. 1 market stock." This is interpreted as being practically free from dirt or other foreign matter, frost injury, second growth, growth cracks, cuts, bruises, or other damages caused by diseases, insects or mechanical means, with no more than a 3 per cent variation by weight from any of the above details. It is also recommended that certified seed be marketed in new sacks or containers.

Size. Inasmuch as oversized tubers are wasteful and less desirable than properly grown, uniform, seed-size potatoes, it is recommended that the seed-size standard shall be from two to twelve ounces, with a variation tolerance of five per centum by weight.

Varietal purity. Since mixed varieties of seed potatoes are a potent cause of economic loss in potato production and marketing, we recommend a rigid adherence to trueness to name. Furthermore, since the practice of renaming old varieties or changing the names of named varieties through ignorance, or with malicious intention to defraud, is detrimental to the potato industry, we recommend the adoption as a standard on nomenclature and use of the "Group Classification and Varietal Descriptions of Some American Potatoes," by Prof. William Stuart of the United States Department of Agriculture.

Since offtype, or runout strains of any given variety are essentially as detrimental to successful potato production as mixtures of varieties, we recommend that no stock shall be certified or planted with the expectation of producing potatoes for certification that are not uniformly typical in all characteristics for that particular variety in the district where it is grown.

PESTS AND DISEASES THAT DISQUALIFY.

No potatoes shall be certified that show by inspection on vine or tuber the presence of the diseases known as black wart (*Chrysophlyctis endobiotica* Schilb.), powdery scab (*Spongospora subterranea* [Wallr.] Johns), and violet rhizoctonia (*Rhizoctonia crocorum* [Pers.] D. C.), and the pests, eelworm (*Heterodera radicicola* [Greef.] Mul.), and potato tuber moth (*Phthorimæa operculella* Zeller).

LIMITATIONS OF OTHER INFECTIONS.

Scab. No potatoes shall be certified which show upon the tuber at final inspection more than 5 per cent scab (*Actinomyces scabies* Thax. [Güssow]), with no deep scab pustules permissible.

Rhizoctonia (black scurf) (*Corticium vagum solani* Burt.) More than 12 per cent shall disqualify and no scurf spot larger than one-eighth inch in diameter shall be permitted.

Vascular infection. Not to exceed 5 per cent of the tubers, as determined by transverse sections of stem end of tuber in the final tuber inspection shall be permitted. Vascular infection shall be interpreted as meaning wilt diseases as *Fusarium oxysporum* (Schlecht), *Verticillium albo-atrum* (Reinke and Berth.), *Bacillus phytophthorus* (Appel *et al.*)

Late blight (*Phytophthora infestans* [Mont.] de Bary.) Not to exceed 2 per cent of the tubers infected with late blight rot spots, and no spot to exceed one-half of an inch.

REGULATIONS GOVERNING VINE INSPECTIONS.

Inspection of potatoes is not only necessary after the crop is harvested but also during the growing season to determine trueness to type and variety, and freedom from disease. This shall be accomplished by an inspection of the potato plants in the field at blooming time, and again just prior to maturity of the plant.

BLOOM TIME INSPECTION.

Variety. More than 5 per cent varietal mixture at this inspection shall disqualify for certification. Furthermore, a variation in type of plants in excess of 10 per cent, indicating degenerate or inferior strains of a variety shall disqualify for certification.

Diseases. More than 10 per cent of the plants at this inspection affected by the following diseases, or more than 5 per cent affected by any one of the following groups of diseases shall disqualify the field for certification:

1. Well defined "curly dwarf," "leaf-roll," "mosaic," or other inherited weaknesses, combined.
2. "Wilt" diseases and "blackleg" combined.
3. Rhizoctonia (black scurf).

Immediately following the bloom-time inspection all diseased or objectionable plants must be rogued.

SECOND PLANT INSPECTION.

At this inspection the tolerances governing certification shall be: Not to exceed 5 per cent of mosaic, curly dwarf, leaf-roll and other inherited weaknesses; not to exceed 2 per cent of diseased plants from any one of the following diseases: wilt, blackleg, and rhizoctonia, nor a total of 4 per cent of diseased plants from these three causes. Roguing of the field must again follow the second plant inspection. If 10 per cent or more of the vines show serious infection of late blight, the field shall be disqualified for certification. The uniformity and quality of the product as seed shall be determined at the second inspection, at which time not to exceed 5 per cent of the hills shall each weigh less than 30 per cent of the average of 100 consecutive hills.

FINAL TUBER INSPECTION.

This inspection shall be after harvest and after final grading for the seed market and shall conform to the conditions as hereinbefore specified.

CERTIFICATE OF INSPECTION.

The following form shall be used for certifying seed potatoes, which certificate shall be furnished the grower:

"This certifies that the potato field and seed stock of _____

_____
(Name) (Post Office) (County)

_____, have been inspected, and that said seed stock meets with
(State)

the prescribed standards relative to varietal purity, type and freedom from disease.

This certificate covers only the seed stock inspected, and is given upon the signing of a statement by the above applicant _____, that he has fulfilled all requirements made by the certifying authority and that he will carry out the full intent and purpose of this certificate.

_____
Certifying Officer.

_____
Agency.

The following statement of conditions pertains to the potato seed stock covered by this certificate of inspection grown by _____

_____
(Name) (Post Office) (County) (State)

1. Varieties and acreage _____
   Certified stock does not exceed _____
2. Results of last field inspection:
   (*a*) Varietal purity _____
   (*b*) Freedom from disease _____
3. Results of final tuber inspection:
   (*a*) Varietal purity _____
   (*b*) Freedom from disease _____
4. Market condition and quality _____
5. Yields and other statements _____

THE CERTIFICATION TAG.

There shall be attached to each bag or container of certified seed a certification tag, stating thereon that the package contains certified seed potatoes, also giving name and address of the grower, the variety of the potatoes and the year grown; however, if the seed potatoes are grown under contract, and to be sold by a party other than the grower they shall meet the requirements as set forth herein and the certification tag shall be marked either with a lot number or the grower's name and the name of the party for whom the potatoes are grown.

On the reverse side of the certification tag the following "Standards for Eligibility to Certification" shall be shown:

"1. Freedom from varietal mixtures, and conformity to the correct vine and tuber characteristics of the variety.

2. Weight of seed tubers from 2 to 12 ounces, with 5 per cent variation tolerance.

3. Freedom from wart, powdery scab, eelworm and larvæ of tuber moth.

4. Freedom from serious infection of common scab, rhizoctonia, wilt, and other important tuber borne diseases.

5. The holder of a certificate is responsible for all undesirable conditions which may develop after the date of the final tuber inspection.

A certificate of seed potato inspection in conformity with the above standards has been issued by _____ to the person whose name appears on the reverse side of this tag."

On the certification tag directions for proper seed dipping or for other general cultural treatments may be printed. At the bottom of the certification tag the name of the inspection official or of the certifying organization should appear.

Signed by Committee:

E. P. Taylor (*Chairman*), *Director of Extension*, Tucson, Arizona.
E. R. Bennett, *Field Horticulturist*, Boise, Idaho.
Mrs. Hilda B. Nielsen, Sebastopol, California.
M. B. McKay, Department of Botany and Plant Pathology, Oregon Agricultural College, Corvallis, Oregon.
H. R. Hagan, *State Inspector*, Utah State Crop and Pest Commission, Salt Lake City, Utah.
A. L. Strausz, *State Horticulturist*, Missoula, Montana.
M. L. Dean, *Chief, Division of Horticulture*, Olympia, Washington.
Geo. M. List, *Chief Deputy State Entomologist*, Fort Collins, Colorado.
W. P. Allewelt, Bureau of Markets, U. S. Department of Agriculture, Washington, D. C.

CROP REPORT AND STATISTICS.

MONTHLY CROP REPORT.

STATE COMMISSION OF HORTICULTURE.

Compiled in cooperation with U. S. Bureau of Crop Estimates, San Francisco, from Reports of County Horticultural Commissioners and Government Crop Reporters.

Prepared by Geo. P. Weldon, Chief Deputy; O. W. Newman, Field Deputy.
June 11, 1919.

Counties	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Cherries (per cent)	Figs (per cent)	Lemons (per cent)	Olives (per cent)	Navel Oranges, %	Valencia Oranges, %	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	20	#	55	100	#	#	#	#	#	#	95	60	50	#
Butte	60	100	#	90	100	#	100	100	#	100	50	#	90	#
Colusa	80	#	#	#	#	#	#	#	#	#	#	#	90	#
Contra Costa	30	#	80	70	#	#	#	#	#	90	85	#	70	#
El Dorado	#	#	#	100	#	#	#	#	#	#	85	100	#	#
Fresno	#	#	165	#	100	95	85	90	#	104	#	103	95	#
Glenn	90	#	90	#	#	#	#	#	#	#	#	#	90	#
Humboldt	#	95	#	#	#	#	#	#	#	#	#	#	#	#
Inyo	#	50	#	#	#	#	#	#	#	#	#	#	#	#
Kern	#	#	100	#	#	#	#	100	#	94	80	#	100	#
Kings	#	#	100	#	#	#	#	#	#	100	#	#	90	#
Lake	90	#	#	#	#	#	#	#	#	#	100	#	80	#
Los Angeles	80	95	95	#	#	96	95	95	100	95	90	85	#	105
Madera	#	#	55	#	#	#	#	#	#	80	#	#	#	#
Mendocino	#	60	#	100	100	#	#	#	#	#	60	#	60	#
Merced	90	#	90	#	#	#	100	#	#	85	#	#	#	#
Monterey	#	93	50	#	#	#	#	#	#	#	#	#	#	#
Napa	50	95	50	75	#	#	#	#	#	100	100	100	100	#
Nevada	#	80	#	60	100	#	#	#	#	#	55	90	#	#
Orange	#	#	85	#	#	92	#	97	99	#	#	#	#	100
Placer	50	90	#	40	100	#	#	#	#	100	55	70	----	----
Riverside	80	100	100	80	100	90	100	95	95	95	85	#	#	100
Sacramento	85	#	90	85	#	#	100	100	#	95	100	85	85	#
San Benito	80	85	80	100	#	#	#	#	#	#	95	#	100	#
San Bernardino	#	120	100	90	#	95	95	100	97	90	#	#	#	100
San Diego	#	90	85	#	100	80	90	#	#	#	#	#	#	#
San Joaquin	70	#	100	100	#	#	100	#	#	100	60	100	100	100
San Luis Obispo	90	#	#	#	#	#	#	#	#	#	#	#	#	100
Santa Barbara	#	#	#	80	#	90	95	#	#	#	#	#	#	102
Santa Clara	100	95	70	90	#	#	#	#	#	100	100	100	100	100
Santa Cruz	#	90	60	65	#	#	#	#	#	#	85	#	#	#
Shasta	#	#	#	#	#	#	90	#	#	#	#	#	100	#
Siskiyou	#	100	#	85	#	#	#	#	#	#	#	#	#	#
Solano	50	#	80	30	#	#	#	#	#	100	95	70	80	#
Sonoma	#	90	75	75	#	#	#	#	#	95	85	90	95	90
Stanislaus	110	#	100	80	100	#	100	#	#	93	90	#	#	#
Sutter	80	#	#	90	#	#	#	#	#	100	100	#	100	#
Tehama	80	#	90	#	#	#	#	#	#	100	90	80	100	#
Tulare	#	#	100	#	100	95	100	90	100	95	#	95	100	#
Ventura	#	#	95	#	#	100	#	100	#	#	#	#	#	102
Yolo	83	#	100	#	100	#	100	#	#	100	80	100	80	#
Yuba	60	#	#	#	#	#	110	#	#	#	110	80	#	#
State average	71	89	85	83	100	91	98	97	98	98	87	81	96	100

Figures indicate conditions of crop in per cent on the basis of 100 as normal.
—Insufficient information for a report.
#Not grown commercially.
hHarvested.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF APRIL, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	85
Passengers arriving from fruit-fly ports	3,397

Horticultural imports:

	Parcels
Passed as free from pests	223,883
Fumigated	834
Refused admittance	40
Contraband destroyed	34
Total parcels horticultural imports for the month	224,791

Pests Intercepted.

From Australia:

Fungus (undetermined) on apples.

From Borneo:

Araecerus fasciculatus, Cryptophagidae, *Lasioderma serricorne* and lepidopterous larvae in nutmeg and various spices.

From Central America:

Saissetia oleae, Aspidiotus lataniae and *Chrysomphalus dictyospermi* on assorted plants.
Camponotus maculatus and *Prenolepis* sp. in tree fern.
Pseudococcus virgatus and *Parlatoria proteus* var. *crotonis* on croton plant.
Pseudococcus sp. and *Aspidiotus* sp. on bananas.

From Chile:

Phthorimaea operculella in potatoes.

From Connecticut:

Pseudococcus citri on gardenia.

From Florida:

Lepidosaphes beckii and *Phomopsis citri* on grapefruit.

From Hawaii:

Hemichionaspis minor, Ripersia palmarum and *Chrysomphalus aonidum* on cocoanuts.
Lecanium sp. on pot plant.
Diaspis bromeliae and *Pseudococcus bromeliae* on pineapples.
Coccus longulus on betel leaves.
Aspidiotus lataniae and *Phenacaspis eugeniae* on mangoes.
Lepidosaphes beckii, Pseudococcus citri, ants and millipeds on croton cuttings.
Weevils in seed pods.

From Japan:

Xyleborus sp. on wistaria.
Otiorynchidæ, slugs, ants and centipedes in packing of nursery stock.
Pseudococcus sp. on cedars.
Aphids, root knot and cicada eggs on persimmons.
Sesiid borer in *Camellia japonica*.

From Mexico:

Weevil (undetermined) in sweet potatoes.
Chloridea obsoleta, fungus and storage rot in tomatoes.

From Nevada:

Heterodera radicicola in potatoes.

From Oregon:
Storage rots in onions.
Scab and *Rhizoctonia* on potatoes.

From Pennsylvania:
Aphis sp. on rose plants.

From Philippine Islands:
Pseudococcus virgatus on croton plant.
Pseudococcus crotonis, Parlatoria pseudaspidiotus and *Pseudaonidia curculiginis* on orchids.

From Tonga:
Ripersia palmarum on cocoanut palm.

From Washington:
Rhizoctonia and *Fusarium* on potatoes.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	25
Fish boats inspected	5
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	211,291½
Fumigated	36½
Refused admittance	7½
Contraband destroyed	3½
Total parcels horticultural imports for the month	211,338½

Pests Intercepted.

From Central America:
Chrysomphalus scutiformis on bananas.

From Georgia:
Parlatoria pergandii on ornamental olive plant.

From Idaho:
Scab and *Rhizoctonia* on potatoes.

From Illinois:
Pseudococcus pseudonipae, Chrysomphalus aonidum and *Aspidiotus hederae* on Kentia palms.

From Japan:
Cicada eggs on persimmon stock.
Cicada eggs and *Eulecanium* sp. on wistaria.

From Mexico:
Chloridea obsoleta on tomatoes.

From Nevada:
Rhizoctonia on potatoes.

From Washington:
Lepidosaphes ulmi on apples.
Rhizoctonia and scab on potatoes.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	31
Fish boats inspected	25
Passengers arriving from fruit-fly ports	34

Horticultural imports:	Parcels
Passed as free from pests	13,804
Fumigated	0
Refused admittance	14
Contraband destroyed	1
Total parcels horticultural imports for the month	13,819

Pests Intercepted.

From Central America:
Aspidiotus cyanophylli on bananas.

From Idaho:
Rhizoctonia on potatoes.

From Mexico:
Chrysomphalus aurantii on lemons.

From Nevada:
Rhizoctonia on potatoes.

From Oregon:
Rhizoctonia on potatoes.

From Washington:
Rhizoctonia on potatoes.

EUREKA STATION.

Steamship and baggage inspection:	
Ships inspected	6
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	0

RIVERSIDE COUNTY STATION.

Horticultural imports:	Parcels
Passed as free from pests	54
Fumigated	0
Refused admittance	0
Contraband destroyed	1
Total parcels horticultural imports for the month	55

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VOLUME VIII

SEP 27 1919

No. 7

MONTHLY BULLETIN

OF THE

STATE COMMISSION OF HORTICULTURE

Bell Tower of the Mission Inn.

PROCEEDINGS

OF THE

Fifty-first Convention of Fruit Growers and Farmers

RIVERSIDE, CALIFORNIA, MAY 28-29, 1919

HELD UNDER THE AUSPICES OF THE

State Commission of Horticulture

SACRAMENTO, CALIFORNIA

JULY, 1919

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CALIFORNIA STATE COMMISSION OF HORTICULTURE

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II. PROCEEDINGS

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held under the auspices of the

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AT

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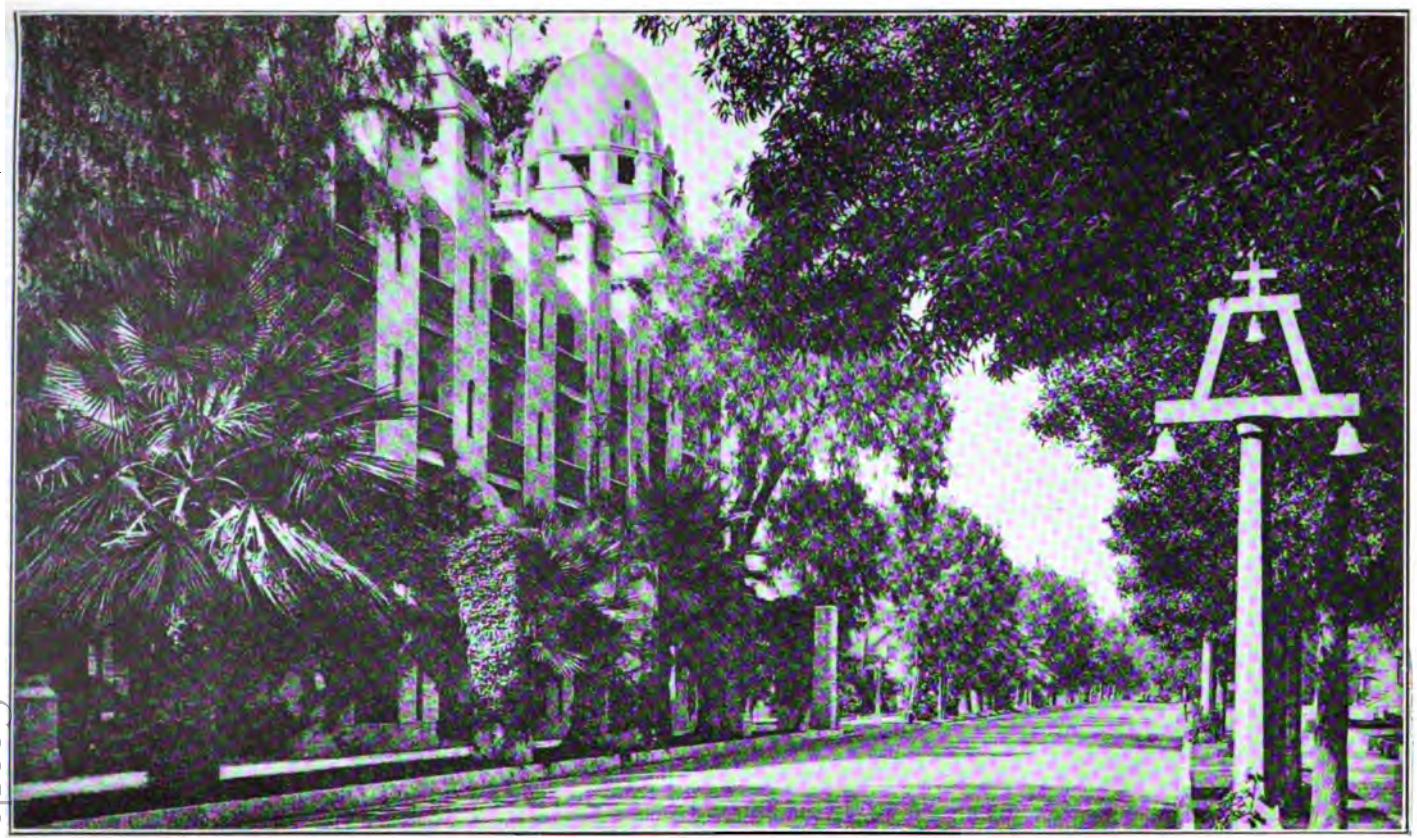

THE MISSION INN; FROM ORANGE STREET.

Headquarters Fifty-first Fruit Growers' Convention, May 28-29, 1919.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

Acceptance for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917; authorized August 27, 1918.

Vol. VIII. July, 1919. No. 7

A BELATED CONVENTION.

"Everything comes to him who waits—provided he waits long enough!" And this is the story of the convention that "just had to be."

The Fifty-first Fruit Growers' Convention was scheduled to be held at Riverside in the spring of 1917. Such were the plans laid at Napa in November, 1916.

The spring of 1917 arrived!

And it brought the war to our country and to us.

Later, plans were formulated for holding the Convention at Riverside in November, 1918.

Then intervened the world-wide epidemic of influenza and once more the Convention was set aside! Yet these obstacles only served to intensify what was to be the most successful of conventions of fruit growers in the history of the state.

After twice being postponed, the morning of May 28, 1919, saw the Fifty-first Fruit Growers' Convention opened at Riverside, California, as related in these pages.

And the moral should be a lesson for fruit growers, farmers and everyday Californians—*"Keep everlastingly at it until you gain your objective!"*

G. H. H.

A CREED FOR CALIFORNIANS.

"The seemingly minor Details of Today are in Composite—the Vital Facts of some unborn Tomorrow."

Blessed with a fertile soil, a kindly climate and a genial people, let us prove that we appreciate these gifts by co-ordinating our works to the end that our efforts shall not be misapplied; That there shall be no such intruding factor as lost motion; That our energies shall attain the maximum results for the common good, that those of the coming days may read and say—

"They builded well! And though they have passed—they and their things and their sayings—still have they builded well!"

Somewhere—someone will harvest tomorrow the seed that is sowed today.

Thus may the minor details of today become, at once, the inspiration and the guide for the coming race to follow. B. A. R.

Art Gallery: The Mission Inn.

COURT: MISSION INN, RIVERSIDE, CALIFORNIA.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VIII. July, 1919. No. 7

PROCEEDINGS OF THE MEETINGS.

Wednesday, May 28, 1919.

Morning Session.

Hon. G. H. Hecke, the State Commissioner of Horticulture, presiding.

Meeting called to order at 9 a.m.

The Chairman—I have the pleasure of opening the Fifty-first Fruit Growers' and Farmers' Convention at Riverside. I am very pleased indeed that Riverside has the distinction of entertaining the conferences that we are holding this week. We had intended at first to open the Fruit Growers' Convention at Pilgrims' Hall, but due to the fact that we have learned to love our spacious and delightful home at the Mission Inn we have come to the conclusion that it would be quite appropriate to open the Fifty-first California Fruit Growers' Convention in this same hall, where during the last two days we have held our plant quarantine meetings. Due to the fact that we have made this change at the last moment, we will not have any music. However, it would be most fitting to honor the flag by opening the Convention singing the first verse of "America."

(*The Convention joins in singing "America."*)

Invocation by Reverend Leighton.

"Our Heavenly Father, we thank Thee for the advantage of living. We thank Thee for the land in which we live, with its splendid traditions, with its bulwarks of righteousness, with its thrilling history, with the beauty and demands of its citizenship. We are gathered here today a company of men and women who are interested in our Country, interested in its future, interested in the problems which now are presenting themselves to us for solution. We pray Thee to let Thy benediction rest on every representative of this Convention, upon our friends and dear ones everywhere. Grant that from this Convention we may go forth and influence the movement that shall make for the betterment of the places in which we reside. Be with our President and those who are gathered around him in that far off land. Let Thy blessing rest on all in our land who hold authority of any kind, that they, with us may seek to accomplish the spread of order, the march of progress and the reign of law, and grant that our nation may fill all of God's purposes for Thy Name and Mercy's Sake, Amen.

The Chairman—I now have the pleasure of introducing to you Mayor Horace Porter of Riverside, who will deliver the address of welcome.

Mayor Porter—MR. CHAIRMAN, LADIES AND GENTLEMEN OF THE FRUIT GROWERS' AND FARMERS' CONVENTION:

We have looked forward with very special interest to your coming and the coming of those who have been holding the other conventions in the last day or two—the nurserymen and the quarantine authorities. You touch us to the very quick in our community life. We are an agricultural and horticultural community. All of your problems are the problems of Riverside and Riverside County.

You men work at the foundations of human life and human well-being. The foundation of human well-being is agriculture, which is perhaps the most ancient and at once the most honorable of the activities of man. I have in my hand, Mr. Chairman, a little volume—a first edition of one of Henry Ward Beecher's essays. Henry Ward Beecher as a young man in Indiana, away back about 1835 to 1840, edited one of the earliest agricultural pages in American history, a department in the "Indiana Farmer," and those papers were so wonderful that later publishers collected them and printed them in a single volume called "Fruits, Flowers and Farming." And I will take the time to read the introductory page out of this, and later I hope you will look through this and see how Beecher discusses all the different great scientific matters of the world, in agriculture and horticulture; how he discusses budding, the nursery business, and how he discusses cross-fertilization problems that were obscure and dark in those days and which are, perhaps, many of them, scientifically settled today. I will read the introductory remarks and Beecher's "Creed for the Farmer."

(*Mr. Porter then reads extract from Henry Ward Beecher.*)

EXTRACT FROM "A PLAIN AND PLEASANT TALK ABOUT FRUITS, FLOWERS AND FARMING."

By Henry Ward Beecher.

"We understand very well that every region must fashion its system of agriculture upon the nature of its soil, its climate, etc. The principles of agriculture may be alike in every zone, but the processes depend upon circumstances. It would be folly for a new country, without commerce, to imitate an old country with an active commerce; it would be folly, where land is cheap, abundant, and naturally fertile, to adopt the habits of those who are stinted in lands, who have a redundant population, and who find a market for even the weeds which are indigenous to the soil. The husbandry of Holland is suited to a wet soil, and of England to a humid atmosphere and a very even annual temperature. But our soil is subject to extreme wet in spring and dryness in summer, to severe cold and intense heat. A farm whose bottom lands are reinvigorated by yearly inundations, may thrive under an exacting husbandry that would exhaust an upland farm in a few years. Modes of agriculture must be suited to circumstances. Nevertheless, the experiments and discoveries and practices of every land are worth our careful attention. We do not import clothes—but we do cloth, to be made up to suit our own habits and wants.

The two extremes of husbandry are: the adoption of every novelty and every experiment indiscriminately, and the rejection of every new thing and every improvement, as indiscriminately. Wisdom consists in: 'proving all things and holding fast that which is good.' We do not advocate large outlays for expensive machines—for fancy cattle, for every new thing that turns up. But when, after full trial, it is ascertained what are the best farm horses, the best breed of cattle, the best milch cows, the most profitable breed of hogs and sheep, and the most skillful routine of cultivation, we think our farmers ought to profit by the knowledge. It is never a good economy to have poor things when you can just as well have the best. This, then, is

OUR CREED.

We believe in small farms and thorough cultivation.

We believe that soil loves to eat, as well as its owner, and ought, therefore, to be manured.

We believe in large crops which leave the land better than they found it—making both the farmer and the farm rich at once.

We believe in going to the bottom of things and, therefore, in deep plowing, and enough of it. All the better if with a subsoil plow.

We believe that every farm should own a good farmer.

We believe that the best fertilizer of any soil, is a spirit of industry, enterprise, and intelligence—without this, lime and gypsum, bones and green manure, marl and guano will be of little use.

We believe in good fences, good barns, good farmhouses, good stock, good orchards—and children enough to gather the fruit!

We believe in a clean kitchen, a neat wife in it, a spinning wheel, a piano, a clean cupboard, a clean dairy, and a clean conscience.

We firmly disbelieve in farmers that will not improve; in farms that grow poorer every year; in starving cattle; in farmers' boys turning into clerks and merchants; in farmers' daughters unwilling to work, and in all farmers ashamed of their vocation, or who drink whiskey till honest people are ashamed of them."

Mayor Porter—Now, Beecher runs through all that book in a marvelous way, discussing the best scientific methods for the day in which he lived. When a young preacher in a pioneer town of 4,000 people in Indiana he edited that department in the "Indiana Farmer." I wish that I might request that at some time in your program you would permit me for twenty minutes to read to you the most remarkable piece of agricultural literature, in some respects, of all the literatures of the world. That wonderful scintillation of Henry Ward Beecher in that great address which he delivered at Iona, New York, at a great Plymouth Church picnic, his wonderful address called "The Political Economy of the Apple," one of the most extraordinary pieces of horticultural literature in the world. I may say that if I were an apple raiser, I would have that reprinted and slip a copy of it into every box of apples that I sent abroad. It would make markets for apples the world around. It is a marvelous thing the way in which he takes up the origin of all the apples, all the kinds, all the stock, all the nursery industry behind it, all the multitude of uses to which apples are put, all the old New England habits of the boy going to bring up apples and the fun we had around the fireplace. It is a marvelous scintillation of a great intellect.

Mr. Chairman, I greet you on behalf of the city of Riverside today, because of our own profound interest in fruit growing and farming. It is our life. We need your splendid influence and out from this will come into our city and county a magnificent influence. We need not only our oranges and lemons, but more of the apple on the mountain sides and dates and cotton near sea level, and, in between, all the fruits which you are discussing.

The Chairman—I have the privilege of thanking you for your words of welcome. It is very evident that Riverside is the center of strong agricultural activity. That is one reason why we are here today! It also indicates that Riverside has "a mayor at its head who understands the value of agricultural advancement," and I thank you again for the inspiring words you have given us this morning. We want to give our members an opportunity of seeing Riverside and to foster a close personal acquaintance which is essential in advancing the interests of agriculture and horticulture. Thus we have not made our program top-

heavy, and I believe that either today or tomorrow we will find an opportunity for asking of you the privilege again, Mr. Mayor, to give us twenty minutes of your time on the subject of Beecher's creed for the farmer that you have brought out here so splendidly.

The chamber of commerce of the city of Riverside has made successful efforts in bringing this Convention here and in looking after its comfort, and I have now the pleasure of calling upon Dr. Harry L. Boardman, secretary of the chamber of commerce of Riverside.

Dr. Boardman—LADIES AND GENTLEMEN:

It affords me pleasure on behalf of the chamber of commerce to extend to you a welcome to Riverside. The chamber of commerce is an institution vitally related to your plans and program. It has been an honor that the local chamber of commerce could have had the opportunity to assist in the preparations for your coming. As a community organization it is the function of the chamber of commerce, through its "conventions committee," to make preparations for meetings such as you are holding here. We have pleasure and satisfaction in doing it. We have had a veteran convention man, Mr. Hammond, as chairman of our committee, whose hand has been upon the entire matter of the arrangements and preparations for this great meeting which is occupying this week. The chamber of commerce can not speak in too high terms of praise of Mr. Hammond's work in behalf of the chamber. The chamber of commerce feels it a special privilege and honor to have had some share in making the preparations for this meeting, which we consider a great representative gathering. I feel a trifle like the old "darky" felt in the South that day when Consul Boak, who was traveling in the South, had an interesting experience with him. Mr. Boak, so the story goes, was traveling in the South when the train stopped at a little Alabama village. He jumped off the train and ran across to a little grocery store to buy something to eat. He did not have any change. He noticed as he went into the little store that an old darky was sitting on the stoop, and he went in to make his purchase; and having made his purchase he tendered a twenty-dollar bill. The groceryman expressed his regret that he could not change the bill. Mr. Boak went out to the front of the little store, and, addressing the "darky" said: "Uncle, could you change this bill for me?" The old darky looked up with an expression of awe and astonishment upon his face. He rose to his feet, and made a very low bow, and said: "Mistah, I is very sorry dat I can't change your bill, but I 'preciates de honor you has conferred upon me, jist de same." I feel a little bit inadequate to "changing the bill" Mr. Hecke has handed me, and I don't know how I can measure up to the requirements of this hour. I would like to say the things that ought to be said on behalf of the chamber of commerce. The modern chamber of commerce is a community welfare organization; it is an organization which relates itself to every part of the community life; it is an organization vitally related to the development of the great country surrounding the city in which it happens to be. Our chamber of commerce is that sort of an organization. The chamber of commerce of the city of Riverside is profoundly concerned with the agricultural and horticultural development of the great country round about us, and we have a great country to the east of us extending for two hundred miles to the

Arizona line, a country which has in it possibilities of as great development, perhaps, as any similar area of the great Pacific coast. It is a vast territory two hundred miles long by some forty or fifty miles wide which really has only been touched as yet in the future development which awaits it. I had the pleasure not long ago to travel in an automobile from Riverside to Blythe. Blythe, as you know, is the center of the great Palo Verde Valley on the extreme eastern side of Riverside County and next to the Colorado River. We drove a hundred miles in crossing the desert, with only the rugged mountain peaks rising on the horizon and the sand and sparse vegetation of the desert to greet one on the way, but when we had arrived at that charming valley next to the Colorado River, we discovered a section of country already provided with a marvelous supply of water from the Colorado River for irrigation purposes, a country which promises to be one of the richest in the southwest land. The chamber of commerce is interested in the development of that valley, and it is interested in the mighty plans for industrial development which are being fostered by the Los Angeles chamber of commerce and which relate themselves to the entire southern California country. We are a part of all that, and, because we are, we feel it is a natural and proper thing for us to be interested in a meeting like yours. It is right that we should be so interested and it would be an incongruity if we were not. We have proved our interest by the work, by what we have done in preparation for your coming, and we wish to further prove our interest by every possible care and comfort which we may be able to give for the success of your meetings throughout their continuance.

It is a great pleasure to me to say this word of welcome to you. I need not recite the beauties of the city of Riverside. The Mayor has spoken briefly of them. We have a long list of virtues and you will understand what some of them are, and I will not recite from any catalog of them, not for the reason that the man was asked to desist who had a bit of unpleasantness with his wife, and his wife was criticizing him pretty strongly, and he said: "Well, I don't propose to parade my virtues." "You could not anyway, if you wanted to," she said, but added: "It takes a large number to make a parade!" It is not for that reason that I refrain from speaking of the virtues of Riverside. They would make "a magnificent parade," but the parade is before you and you have only to ride around our splendid avenues and climb our hill and get our vista and prospects to know that we are able to parade our virtues if we so wished.

I was reading not very long ago a paragraph in a book written by the late Professor Walter Rauschenbusch, who was one of the great social workers of this age, recently deceased. He was dwelling upon the vital relationship between morals and moral teachings and the moral development and civic and commercial life of communities. He was deprecating the way in which it has been characteristic for time "out of mind" to segregate the religious and the spiritual into one segment and the commercial into another, and to keep these very carefully separated from each other; and he was saying that any true religion and any true morals must find their way into the commercial and civic and industrial life of a community, and he stated as an illustration an incident that came under his observation in a town in the province of Quebec, Canada. There was a community of Mennonites, men who are noted for their religious spirit

and character. They were dairying people and they shipped their milk to the city of Toronto or some neighboring metropolis. The supervisors of the distribution of milk in the city or state government were very particular about the quality and character of milk that those men were shipping into the city and they had a way of marking any that came into the city which would not measure up to the tests which the state authorities applied to this product. They had a way of putting a great red label on the can and sending it back to the station from which it came, the object being if a man found a great red label pasted on his milk can it would be a rebuke which he would find it difficult to evade.

It so happened that upon one occasion a group of these men were standing at the station and were laughingly commenting on the red label pasted on a certain man's milk can. Presently this man came up to the group. He saw the red label on his can and he passed at once into an expostulation which was not characteristic of religious fervor, but which was marked by an element of what is commonly known as profanity. The men were laughing at the can and the red label on the can. But when this brother in the church allowed himself to fall so far from grace as to become lurid in his denunciation of what he seemed to feel a great injustice to himself, these men became solemn and downcast in their appearance, and the upshot was that they brought this man up before the church and turned him out of the fellowship of the church. Why? Not because he had sold milk in the city of Toronto which might spread the germs of disease and destroy the lives of a hundred babies, but because, forsooth, when rebuked for a thing like that he had broken into profanity, and that was an offense which the church could by no means tolerate. But the poisoning of a hundred babies—that possibly was a joke. This was Dr. Rauschenbusch's illustration, and a most effective illustration it seemed to me to be, of the way in which there is a tendency to segregate the religious and commercial into separate mixture-proof compartments, so that they have no relationship one to another. It is an utter fallacy. Now, it is the function of the modern chamber of commerce in any community to minister to the uniting of these two things, and to make the community an honest one, and to put into the whole community interest the spirit of loyalty to high principles and the cultivation of everything vital to true righteousness and honor which make for any community's highest well being. That is your purpose. That is our purpose; and upon the common ground of this purpose we meet here and are glad to meet upon that ground. It is a great privilege for me to express the welcome of the chamber of commerce to you. You are here discharging the functions of your organization. You are here under the leadership of Mr. Hecke, known to us all as a representative, efficient and capable man in the leadership of the great work which you represent. I need not tell Mr. Hecke how to do it.

Elihu Root, in those days before he went into the State Department at Washington, when he was practicing law in the city of New York, had an office boy by the name of Jimmie. One day Jimmie came bowling into the office, slammed the door behind him, threw his cap at a hook on the wall, and said: "There is a baseball game at the park this afternoon, Mr. Root, and I want to get off and go." Mr. Root said: "Jimmie, perhaps we can arrange that, but I don't like the way you have of asking for favors of that sort. You come and sit here in this chair and I will

show you how to ask for a favor of that sort." So Mr. Root vacated the big office chair and Jimmie came and ensconced himself in the chair. Mr. Root picked up Jimmie's cap and went out of the door into the hall. Presently the door opened and Mr. Root came in holding the cap properly in his hand, shut the door quietly behind him, made a bow to the office chair, addressed the occupant, and said: "Mr. Root, there is to be a great ball game at the park this afternoon, and if you could arrange it, sir, I would like so much to be excused so that I might attend this ball game." "All right, Jimmie," said the boy from the office chair, "run along, and here is 50 cents to pay your way in." So while Mr. Root was showing Jimmie, Jimmie was after all showing Mr. Root. He was quite capable of doing it.

Of course Mr. Hecke needs no introduction, and it is my good fortune now to turn this meeting over to Mr. Hecke, who will deliver his annual address.

The Chairman (Mr. Hecke)—I thank the chamber of commerce for the splendid preparations made for the reception of our delegates. We have listened with keen enjoyment to the addresses that have been given here by representatives of Riverside, and you will have noted by this time that these gentlemen, like Henry Ward Beecher, are of a learned disposition, and eloquent in delivery of their message. This is not surprising, for Mr. Porter, before he was elected Mayor of this community, was the minister of the First Congregational Church. You have heard Mr. Leighton, who is now the minister of the same church, and our friend Dr. Boardman used to preside over the destinies of the Baptist Church. This surely accounts for the clean atmosphere of Riverside. During the last two days we have not had any opportunity of meeting the people of Riverside because we have been so busy at our meetings. But most of us know from former experiences that what Mr. Porter has said in regard to the clean atmosphere of Riverside is absolutely correct. About one month after my appointment as State Commissioner of Horticulture, the California Fruit Growers had a Convention at Napa, in November, 1916, and before the Convention was over we received a telegram from the chamber of commerce of Riverside requesting us to hold our spring Convention of 1917 at Riverside. We gladly consented. The spring of 1917 arrived and with it our participation in the great war. New duties were thrust upon us, and we gladly undertook these new duties, but it made it impossible for us to hold our promise to come to Riverside with our Convention in 1917. During the war with its many responsibilities, we did not feel that the time was fitting for holding a Convention, but in 1918 in November, we again decided that the Convention should be at Riverside. The widespread influenza epidemic willed it otherwise. We could not come, but at last after many disappointments we finally decided upon the latter part of May in 1919 as the proper time to convene. And here we are! I now take pleasure in giving you the annual report which should have been given to you in November, 1918.

(*The Chairman thereupon read the report as follows*):

THE FIFTY-FIRST CONVENTION OF FRUIT GROWERS AND FARMERS.

By G. H. HECKE, Sacramento, California.

INTRODUCTION.

In the course of my few years of public work it is but seldom that I have experienced the genuine pleasure that I feel today at being present at Riverside and in looking forward to what will be accomplished before this, the Fifty-first Fruit Growers' and Farmers' Convention. The only thing which mars the horizon today is my very great regret that through the press of urgent business there are those who have been unable to foregather with us. At this time, engrossed as we are with the many problems which have brought us together, let us remember and bless the memory of the many who are prevented from being with us because they have made the great sacrifice to their flag and to their country.

This occasion is to be made memorable for many reasons. It is the first time in history that so great a representation of allied interests has convened for the common welfare of the country. We are now facing a situation of food deficiency in Europe, which calls upon us to speed up every unit from the standpoint of production. While we have the promise in this state of one of the greatest years of yield, we are assured that none of it will be wasted and every pound and ton must be so placed as to do the maximum good.

THE PIONEERS OF HORTICULTURE AND AGRICULTURE.

It is particularly fitting that this beautiful location should have been selected for these conferences, for it was in southern California that the first permanent settlement was made; it was in southern California that the first experiments were undertaken, as forerunners of the now successful biological control of insect pests; it was in southern California that our first Commissioner of Horticulture, the late Ellwood Cooper, made his home and conducted his life work to promote the advance of horticulture and agriculture in the state.

It is a far cry from the efforts of those pioneers of horticulture, Matthew Cooke, Alexander Craw and B. M. Lelong, but the work which they accomplished was the foundation on which we have been able to build the efficient structure which we have at the present time. The horticultural history of the United States carries few names of greater importance than those who have helped to make California's early history. One of the greatest foreign insect collectors of the world was the late Albert Koebele. The work which he and others have done in investigating and securing beneficial insects from abroad is now well known to all. It is impossible to say what might have happened had we not secured the Vedalia in time to aid in the fight against the cottony cushion scale. It is not pleasant to try to picture what catastrophe will follow an accidental introduction on this coast of the Mediterranean fruit fly, or the melon fly.

The history of horticultural pest control began over 39 years ago when the first Board of Viticultural Commissioners was established under Governor George C. Perkins. In 1883, came the first Board of Horticulture, which was changed in 1903 to the State Commission of Horticulture. The scope of our work has enlarged considerably since the days when Matthew Cooke first took up the war on insects. We have taken up horticultural quarantine at the maritime ports of entry, the search for beneficial insects, the standardization of fruits, the control of rodents, and the publication of special bulletins.

HORTICULTURAL LEGISLATION.

Our legislative program for the last session of the legislature contained several important bills. There is not time to discuss them fully. Fresh fruit standardization laws passed in 1917 have been remodeled, based on the experience of two years' work. Besides fresh fruits, standardization is now applied to dried fruits, vegetables and nuts. Two deputies are provided for in the new law. Their efforts will chiefly be devoted to standardizing the work in the various counties. There is a bill establishing standards of purity and viability of, and providing for uniform labels for, agricultural seed sold within the state. Potato seed certification, which is strongly urged by the potato growers, has been provided. This bill

supersedes the former potato seed certification law which experience had shown was not adequate.

PLANT PEST CONTROL.

California has a system of reducing the unnecessary losses caused by plant pests which was worked out by our horticultural pioneers a good many years ago. At that time only a comparatively small number of the counties desired horticultural protection and hence this work was started with the county as the unit and thus was created the position of county horticultural commissioner. The work grew in importance and in volume until the state took it up and we had the first State Board of Horticulture. The state-wide character of this work has steadily increased and this together with the rapid growth of the plant industry itself has necessitated many changes in the legal machinery. As a natural result we have a state officer operating under one law and county horticultural commissioners operating under another.

The continued growth of the fruit-growing industry and the attendant need for increased efficiency in plant pest control and protection make it necessary to give careful consideration to the next step in advance, which will be consolidation of state and county efforts along these lines. Until we have this work under the direction and control of the state, we will not get that degree of uniformity and elasticity so needful to keep pace with an industry so widely varied in character and so rapidly expanding in volume. During the past year we worked out the plans for such a consolidation. That these plans were not submitted to the legislature was due to the fact that funds in the state treasury were not sufficient to stand the strain of the transfer all at once of this expense from fifty county treasuries to that of the state. A substitute was therefore considered which conferred greater discretionary powers upon the state over the work in the various counties, and which would not increase the demands upon the state treasury. The bill creating the Department of Agriculture contained similar provisions, and hence a partial step in this direction has been taken. We must recognize the need for and adopt plans to obtain a system wherein the county horticultural commissioners will be taken over by the state, their activities to be under the direction of the state, and their salaries paid from the treasury of the state.

FRUIT STANDARDIZATION.

The executive office has carried on the work of fruit standardization as required under the standardization laws of 1917. Standardization by law is new in California, since the original acts were passed in 1915, and it has therefore been necessary to do much experimental work. At no time, however, has the necessity for arriving at a safe and sane course of procedure as a foundation for the future been overlooked. Many things have been accomplished during the past four years, which have resulted in considerable benefit to the California fruit trade. Standardization has had a tendency to stabilize the industry and insure a higher quality.

One of the most striking results of standardization may be found in the case of table grape shipments in California. Those who are familiar with the shipping-grape industry are aware of the fact that there was danger of prices becoming so low at one time that grapes could not be grown profitably. It is also known that one of the things that brought about such low prices was the dumping on the Eastern markets of green, immature grapes. The requirement that grapes must contain 17 per cent sugar, except in the case of Emperor, Cornichon and Gros Coleman, which must contain 16 per cent sugar, has been enforced uniformly by the county horticultural commissioners in the grape growing districts of the state, and the industry has practically been put on its feet by this provision of the law. The effect of standardization in regard to grapes was especially apparent in Tulare and Fresno counties the past year. It was found necessary for the State Commissioner of Horticulture to place a chief inspector in these counties to settle differences of opinion, and the results of this work were very satisfactory.

Due to certain reasons which were thought to be important at the time these acts were created, the standardization of apples was placed in the hands of the State Commissioner of Horticulture, while the other fresh fruits were placed under the supervision of the county horticultural commissioners, with the State Commissioner of Horticulture and his deputy acting as inspectors in chief.

A number of testimonials have been received indicating that the enforcement of the apple act has resulted in immeasurable good to the industry. The sale of apple grade stamps by the commissioner last season, as provided for by law, brought in a total sum of $13,543.66. This money was used for the employment of inspectors in the apple growing districts of the state. These districts are increasing in size very rapidly and apple growing promises to become one of our principal horticultural industries. Already California ranks fifth among the states of the Union in point of apple production. In order to market our increasing crop, it is necessary that we pack only the finest fruit so that the trade will recognize the quality of "California" brands and create an increasing demand.

In the enforcement of the fresh fruit standardization law the work of many county officials is very commendable and certain of the principal fruit shipping counties have been greatly benefited. Yet in some other important counties scarcely anything has been done, and were the results throughout the entire state of a similar nature standardization by law could be branded as a failure. Viewed as a whole, however, the results of standardization up to date may be considered very satisfactory.

To place standardization on a firmer basis so that it will affect all fruits and all sections alike is the big problem of the future. We must also devise a means of further preventing the shipment of green, immature fruit. The inevitable result of shipping such fruit is the complete demoralization of the markets. There is only one way to check the desire of the growers, packers and shippers to take advantage of the high prices which practically always obtain during the early part of the fruit season namely, to place quality restrictions on fruit shipments.

QUARANTINE DIVISION.

The quarantine service of the Commission, in operation at the several maritime ports of entry on the California coast line, has continued to put into execution all provisions of the state quarantine law and those of all current quarantine orders issued by the State Commissioner of Horticulture. The federal government has also continued to entrust the enforcement of its numerous horticultural quarantines at the California ports of entry to the inspectors of the Commission, who, in such instances, act as collaborators of the United States Department of Agriculture, and the Federal Horticultural Board has given evidence in a pronounced manner of its confidence in the methods employed by the inspectors to accomplish this purpose and the results that have ensued.

The abnormal conditions that have obtained at all ports and in all channels of commerce during the past two years demanded a fuller measure of common sense in the execution of horticultural quarantine regulations than ever before. That the service as a whole proved itself equal to the occasion is found in the two fundamental facts: No new insect pests or plant diseases of major importance have been recorded as having become established in our state, and, despite the congestion of traffic, the drastic provisions of the inspection laws were carried out as conceived and enacted into the statutes, without any serious complaint or legal contest of the actions and rulings of the quarantine service during this critical period. The necessity of such activity at that time, as at any other, is established by the reported findings of the service which show that several species of fruit flies, gipsy moth, cotton-boll weevil, pink bollworm of cotton, alfalfa weevil, Colorado potato beetle, sweet-potato weevil and many other new and dangerous insect pests were intercepted and destroyed on plant products seeking an entrance into the state.

The educational and co-operative policies of the service have been pursued with diligence, and the results obtained from this insistent propaganda have done as much toward maintaining a complete quarantine as any other factor in the service. The Division has also kept in intimate touch with the great quarantine service of the interior of the state, and has endeavored in every manner to make itself useful to the state quarantine guardians by furnishing advance information covering imports of plants into their respective territories, showing the distribution of injurious crop pests in other states of the United States, the identification of intercepted pests, by loans of lantern slides for lectures, and in advice based upon actual and extended practice in the better methods of interpreting the intent and executing the provisions of the quarantine law.

INSECTARY DIVISION.

To the Insectary Division is entrusted the work of the Commission in connection with the control of insect pests of the horticultural industry of the state During the year just past figures have been secured by the Insecticide Laboratory of the University of California, which show that approximately three millions of dollars was spent in California during that period for insecticides alone. This does not include the cost of application, which is probably fully as great as the cost of the material, and goes to show the enormous problem the control of insect pests is in this state. Besides the actual cost of control there is, in addition, a great amount of damage in cases where control measures are for various reasons not undertaken which is variously estimated at from 10 to 20 per cent of the gross value of the horticultural products. Much of this loss can be prevented by the proper treatment of infested orchards and crops, and the state can not and does not spend funds more profitably than in aiding the farmers in this work.

The work of the Insectary Division in connection with the control of pests by the use of their natural enemies has during the past year met with the greatest success. The establishment of the southern branch in Los Angeles County for the purpose of aiding the citrus growers in the control of mealybugs has brought phenomenal results and is everywhere appreciated, and the demand for its continuance and further development is heard on every side. These results have been made possible only through the wisdom of the Governor and the State Board of Control in permitting us to expend a certain sum from the "War Emergency Fund" to provide for the maintenance of the southern branch. Mr. C. C. Teague, concerning this work, writes:

> "I am more thoroughly convinced than ever of the great effect of this work, and believe that it is possible to obtain parasites that will control most of the injurious insects which prey upon the horticulture and agriculture of the state. The millions of dollars that are spent annually in the control of these insects, and the great loss in fruit and food crops due to them, certainly warrant the state in expending a considerable sum of money in searching for natural enemies and in rearing and distributing those that have already been found to effectively control some of these pests. We have a great example in this community of the possibility of natural enemy control, in the control of the mealybug, which is one of our worst pests."

From Mr. E. S. Thatcher, who also has had occasion to observe this work, we have this statement:

> "As we have these enemies to fight the cost of handling them is reduced to an insignificant burden when beneficial insects are found competent, as they have already been in many cases—the Vedalia versus the cottony cushion scale being, up to date, the favorite example. The mealybug control seems to offer an exhibition of success almost as notable and it is certain that progress is being made toward completion in that case. The good that has been done by the State Insectary is doubtless of a value that would make its cost a negligible item, and if it can be supported by further experiment and exploration its services may be indefinitely extended—not to horticulture only but to field agriculture as well, since insects, fungi, etc., are as active on the level as overhead."

The mealybug has presented a peculiarly difficult problem to the citrus growers, since it has been practically impossible to control it by spraying or fumigation. The Insectary Division during the past year has demonstrated that it can be controlled by the liberation of large numbers of natural enemies in the orchard at the right season. This work has been carried out on a field scale and we have succeeded in making commercially clean, orchards which have for several years been heavily infested with these pests.

The people of Ventura County have been so impressed with our demonstration that they have voluntarily contributed funds and have built the Ventura Branch Insectary, which is to be operated under our direction.

We have now arranged to send an expert collector to South Africa for the purpose of securing additional enemies of the black scale and mealybug.

We have, at the request of the French Minister of Agriculture, supplied France with information on the parasite work as carried on by the Insectary Division, and with plans and specifications of our buildings and rearing equipment. As a result of the success of this work in California, France has, during the war, established an insectary at Mentone and is prosecuting this work vigorously. We have also been able to supply them with colonies of our beneficial insects, which they have received in good condition.

During the year we have distributed about seventy-five million of the aphis-destroying ladybirds, *Hippodamia convergens*. This work is of great benefit to the cantaloupe, bean and grain growers. In co-operation with the U. S. Department of Agriculture we are now carrying on a scientific investigation of the practical value of this work.

Through a survey of the state during the past year, we have been able to outline the distribution of the citrus whiteflies in California. They now occur in the cities of Marysville, Sacramento and Bakersfield. This insect is the most serious pest of citrus in Florida, causing the loss of over a million dollars a year to the citrus industry. It has not yet become established in our citrus orchards, except at Oroville some years ago, where the State Commissioner of Horticulture succeeded in exterminating it. Its presence on dooryard trees and ornamentals in Marysville, Sacramento and Bakersfield constitutes a great menace to our citrus groves and the extermination of this pest in these places should be undertaken without delay. Once it gains a foothold in the citrus-producing sections of California, its eradication will be a practical impossibility.

During 1918 an outbreak of a serious snail pest (*Helix pisana*) was discovered in San Diego County. Work is now under way, which has as its object the extermination of this pest.

This division of the commissioner's office has inaugurated an agricultural pest survey of the state, which, when completed, will be of great value in our work of preventing spread of pests to clean areas of the state. We have now mapped 16 of our most important insect pests, together with 18 species of ground squirrels, and expect to make greater advances during the next year, including plant diseases and weeds, as well as insects and rodents.

THE RODENT CONTROL DIVISION.

The rodent control division in taking up the work of control of rodents had first to arrange a foundation for state-wide simultaneous action. A preliminary survey of state lands was followed by squirrel eradication crews operated by the division. Arrangements were completed with the United States Bureau of Biological Survey by which that department took up the work on government lands. Co-operative agreements were made with the railroads for squirrel control on railroad lands and rights of way, with the State Highway Commission for squirrel control on the state highway system, with the county boards of supervisors for squirrel control on county highways. By enlisting the support of these several factors, it was possible to supplement the work of the county horticultural commissioners on privately owned lands within the various counties.

In addition to these operations there have been many educational and publicity campaigns to aid in counties where county horticultural commissioners are engaged in destroying rodent pests. The first of these was known as "Squirrel Week," April 29 to May 4, 1918, which Governor Stephens in a proclamation set aside as a period to be devoted to concerted efforts against ground squirrels. Squirrel drives were made in many sections, one in Big Valley, Lassen County, being particularly successful. One of the largest of these drives was made in Antelope Valley when 184,560 acres were treated with poisoned barley; 181 individuals on foot, horseback and in autos took part in this four days' drive, distributing five tons of the poisoned grain.

Arrangements with the U. S. Bureau of Biological Survey permitted this division to buy poisons at greatly reduced prices. These poisons have in turn been sold to the county horticultural commissioners at cost, which has decreased to a great extent the expense of rodent control throughout the state. On saccharin alone the difference in price between that distributed by the division at $5.50 a pound and the regular market price of $23 a pound effected a very considerable saving.

Jute wasteballs secured from the State Prison at San Quentin have been sold to the county horticultural commissioners for use with carbon bisulphid in ground squirrel control during the winter season; 3,145,000 of these wasteballs have been placed with the various counties at an average price of $3 a thousand. The market price on wasteballs previously has been $6 a thousand, making a saving of $4,500 in this one item.

We here at this convention are going to set up another milestone in our advance, for never before has there been such complete representation of all interests brought together for co-operative purposes. Good constructive work along all lines of horticulture and agriculture must inevitably result from the united efforts of the six great organizations which are meeting here. The quarantine officials, the fruit growers and farmers, the nurserymen, the entomologists, the vegetable growers and county horticultural commissioners are spending a week in discussing from their several angles the welfare of our great industry. I am indeed pleased with the prospects for future successes with our progress based on such a mutual understanding as we have attained during these delightful days at Riverside.

And now we come to the dawn of a new era. The office of Commissioner of Horticulture which it has been my fortune to hold during the last three years is about to become a thing of the past and will be absorbed by the newly created Department of Agriculture. While we have accomplished a great deal in the past, the possibilities for the future are unlimited. Beginning July 22, the two great branches of agriculture, animal industry as well as plant industry, will be united.

It was no small task thus to select from the many state institutions those which should be brought together into a department of agriculture. It required a careful analysis of the purposes for which each department concerned was created. It required a thorough knowledge of the working organization needed to achieve that purpose and a firm determination to enhance rather than infringe upon the service rendered to the State of California by each of these departments. The creation of this Department of Agriculture is a new step in California's scheme of government and Governor Stephens in establishing this precedent was assured that the progress made in the past not only would be maintained but that new and greater successes would come in the future as the result of his act.

The Chairman—Now we will proceed with the regular program. I take pleasure in introducing to you George C. Roeding, President of the Agricultural Society, who will speak on its functions.

Mr. Roeding—MR. COMMISSIONER, FRUIT GROWERS AND FARMERS OF CALIFORNIA:

I think in making my remarks and including the Fruit Growers and speaking of the Fruit Growers and Farmers of California, I am including with them, all the allied agencies, the entomologists and others referred to by our commissioner. I have no prepared address to present today, and if my remarks are rather disconnected, I want you to receive them in the right spirit. As a rule when I address Fruit Growers' Conventions, my theme seems to tend very largely with my experiences with horticultural commissioners. In fact, I think I may safely say that if I failed to say something about horticultural commissioners or any subject in reference to fruit growing, the horticultural commissioners would be grievously disappointed. It is probable in this instance that I am going to commence my remarks and take advantage of my position, although I am talking in behalf of the State Agricultural Society of California, to say something of a personal nature. The reason I am doing this is because I want to try to ingratiate myself, not only in the good graces of the fruit growers and farmers of California, but also with the horticultural commissioners, because I know a great many here are horticultural com-

missioners this morning. I want to tell you a story or two about how the horticultural commissioners regard a nurseryman. I had a friend in Fresno, who was at one time known as the king of the raisin business. He was associated with me in business. He was also always endeavoring to become associated with me in the nursery business. He considered that the nursery business was the most profitable business in fruit growing, and he remarked to me one day that when a certain party sold a tree for 20 cents he made 21 cents. I want to show you the position also that the nurseryman stands in. I happened to be talking to an automobile man a short time ago. The automobile business is something that all of us are interested in. Very few of us appreciate, I think, that the automobile business is surrounded with a great many difficulties. This friend of mine was trying to sell me an automobile. I intimated to him that I could not afford to buy an automobile. He was rather insistent that I ought to buy an automobile and finally in the course of our conversation he said: "You know I was out of town a few days ago and I noticed where a nurseryman, a competitor of mine, was pulling out a lot of trees and burning them. Why was that?" I said: "That is one of the troubles of the nursery business. If we could only sell all the trees we grow, the nursery business would be a great business, but unfortunately our sales are regulated by the demand for some particular fruit, and the result is if some particular fruit has not brought a high price the previous season, we burn up our trees." The man thought a minute, and said: "Yes, I see. When I buy one tree I pay for ten."

(*Reading from report*):

At no time in the history of the world is the producer of articles of food so necessary to the well being of the nation as at this time. As representatives of the great producing interests of California, let us cheerfully do our share and give our aid in promoting the wonderful resources with which this grand state of ours has been so magnificently endowed. It is very fortunate indeed that the new agricultural bill, which is the result of the efficiency and economy investigation made by Governor Stephens, will go into effect. I do not think that we have been informed up to this time whether this bill has been signed by the Governor, but I believe there is every indication that the Governor will sign this bill.

The Chairman—It has been signed.

Mr. Roeding—I am very glad to know that. I think the fruit growers and agriculturists of California have good reason to thank Governor Stephens, for, out of all this investigation, originating this idea in connection with a measure which is going to mean a new era in matters pertaining to finance in the operation of our government. I look forward now, hoping that the Commissioner of Horticulture, our Chairman, will be appointed Director of Agriculture. The reason I make this statement is this: there is one thing I believe in above every other, and that is in community work. There is another thing I believe in above any other, and that is that the men who are carrying on such work as our present Commissioner of Horticulture and others do, appreciate the cause above everything else. In other words, the cause should be their first consideration. I think that every farmer and every fruit grower in this army will agree with me that we would look on the man who

represent us in the legislature and otherwise in a different light than we do in many instances if they sincerely looked upon the cause that they were working for rather than their own aggrandizement. When we see a man who is sincerely and honestly striving for the best interests of his community, who is willing to efface himself for the benefit of the community and the people, we ought to stand at his back and sustain him by all means. I am quite sure, and I feel sincerely and honestly that our present Commissioner of Horticulture is going to operate along the same lines that he has exhibited in the past, in working in behalf of the horticulturists and the farmers of California in a much more enlarged manner than he has been able to do in the past and that he is going to do so because he is going to have the power behind him and he is going to look at the issue in a manner which is sincere and which will prove beneficial to all of us. I can say with some degree of truthfulness that Mr. Hecke and myself had something to do with the framing of this bill and getting it into its present condition. The reason I said a few minutes ago I believe this measure is going to mean something to the State of California, and it is a great step in advance, is because I believe we ought to have a Secretary of Agriculture and we ought to have several other secretaries in an advisory capacity to our Governor, the same as we have a cabinet for the President of the United States. I believe that will be a solution of a good many abuses, but that depends, ladies and gentlemen, on the men who are selected to occupy these places. Those men must sincerely see the cause in front of them above everything else. They must be willing to efface themselves and not look forward to political preferment, but to the benefits to accrue to state in which they occupy a public position, and I hope as a result of the work of Mr. Hecke that something will evolve to bring about this condition of affairs in the State of California.

Now a few words about the State Agricultural Society. The State Agricultural Society for a great many years was operated apparently for only one purpose—that is to encourage the game of racing horses, not for the benefit of the farmer and fruit grower, but for the encouragement of horse racing. There is no objection today to having horse racing if it is legitimate. It is not necessary for me to tell you how much harm was done by the encouragement of horse racing along the plans on which it was carried out.

I want you to understand that as a representative of the State Agricultural Society, I am not finding fault with those who preceded me. That is not my method of doing things. There must always be a start. There must always be an education. This is going to be arrived at. In the meantime, I think that this education is not only coming to us stronger now than ever before, but I want to say in behalf of the State Agricultural Society that they are seeing things in a different light from that which they did before. We have had untold difficulties—like every other organization in California—in securing the necessary funds to carry on the work along the lines that would be beneficial to the people of the State of California. When I was made president of the State Agricultural Society, in my statement to the directors—and there are twelve men selected from various parts of the state—I said that my first efforts of all would be for the State of California; second

of all to the State Horticultural Society; thirdly, to the directors, and lastly to myself, and I have tried to carry that out.

The State Agricultural Society, as it stands today, instead of being the State Agricultural Society, is nothing more or less than the State Board of Fair Commissioners. We receive correspondence from all parts of the world. The people in other states look upon the State Agricultural Society as the organization which is shaping everything in the State of California. But our powers do not go beyond the fact that we are really nothing more or less than a State Fair Commission. But in spite of all this, I appreciate the fact that we are in a position to do something, but we will not accomplish our purposes and we will not progress unless we have some definite plans in view.

I spoke to you a few minutes ago about this report. This is the only report of its kind that is issued in the State of California. It covers a greater field than any other report issued in the State of California. This report is demanded by foreign countries, is sent to all the agricultural experimental stations. It is demanded in Washington. In fact, it covers a great field on statistics and other matters which are invaluable. We have an appropriation of $5,000 for this report annually. I endeavored to have this appropriation increased to $10,000 this year, because I want to have this report cover a greater field. In other words, what I am looking forward to in matters of this kind, is not to simply have the State Agricultural Society operate in itself, but what I am looking forward to is to have the co-operative efforts of the Commissioner of Horticulture and the University of California and every other organization which will mean something to the farmers and fruit growers of California. That is what I want to do and we will probably be able to do something in this direction now, but not to the point that I would like to see it carried out. But I hope, with the co-operation with the Commissioner of Horticulture and the University of California that this report can be made more valuable than it has been heretofore.

Just to give you an idea, and I am not saying this because I want to throw bouquets at myself—when I first became a member of the State Agricultural Society—this book is prepared by a man who is known as the State Statistician. He is really a servant of the board but hardly a director on that board. As I said the other night, I regarded the horticultural commissioners as a necessary evil. I told the members of my board that this report really was the only thing to show what the State Agricultural Society was doing in the State of California, and that they should take a personal interest in the development of this report; that the fairs we had were only an incident to our work; that the state fairs which we held annually were only seen by comparatively a few people, but this report showed what we were actually doing, and it should receive more attention and more thought than it had in the past, and I am glad to say that this report is now in its course of development and I hope that in the enlarged work that we have before us and the co-operation which we expect to have of the various agencies which are friendly to this society, that we will be able to do something with this report. Not what we would like to do, but it will be a beginning in giving information about the agricultural and horticultural resources and animal industries of California, which will mean something to all the farmers and fruit growers of this state. This year, for the first time

in our history, we are going to have an agricultural and horticultural building which all the members of the Horticultural Board are exceedingly proud of. It is the beginning of a new era for the State Agricultural Society, as far as our fairs are concerned. This building has cost $300,000. It is built of steel and brick. It is 485 feet long and 125 feet wide. It can be seen from all parts of Sacramento, and is almost as striking as our state capitol.

At this time I want to take advantage of the opportunity of impressing all of you here to help us to make the State Fair a success. We have the nucleus now in this building of something which places us in a position to accomplish a purpose which is going to add to the agricultural and horticultural results of this state. You ask, how will this be done? We are endeavoring to bring exhibitors from all parts of the state that have agricultural and horticultural products and anything else that pertains to the soil, to Sacramento to exhibit and create competition between them. This is a grand opportunity for people to see in one spot the development of agriculture and horticulture. I want to say—by the way, my friend Dean Hunt is sitting in front of me—that the University of California is making a great exhibit at the Agricultural Society and to show you the broad viewpoint the University of California is taking in a matter of this kind, none of their exhibits are entered for competition, but they come there more for a purpose of presenting their exhibits in a way that will prove of educational value to the people who come to the fair. In my remarks to the board of directors, I have said this: "If we are going to accomplish anything, gentlemen, if we are going to help the farmers of the State of California, we want to exhibit to them a building that will be of such a character that when they come to our fairs they will derive something of educational value from it, so that when they return to their homes, they will be able to say we have seen such and such a thing at the State Fair, and it is something better than we have ever seen before, and we want to develop our own farm and our own buildings and our methods of agriculture and horticulture along the line of these practical demonstrations. That is the purpose back of an institution like ours. The only difficulty that we are up against now, is to secure the necessary funds to carry on this work, but I have said to the board of directors and I am endeavoring to carry out this idea, that we must have a preconceived plan of what we are going to do. We are now having a minute plan made of what we expect to do in the future. The buildings necessary to complete this State Fair will necessitate an outlay of a million dollars. It is not possible to get that amount of money at one time, but not only in this matter but in others, we are not going to get what we want from our legislature unless we present something to it, so that when we ask for an appropriation of $300,000 or $500,000, we can say, 'Gentlemen, this is the character of the buildings we want to erect.' And that immediately gives them confidence that we are seeing far enough ahead and we expect to accomplish something of a concrete nature."

Just to illustrate some of the difficulties we had with our present building, for five months, ladies and gentlemen, we fought the state architect's office because there was a difference of opinion as to the character of the building we wanted. Today we are invoking the aid

of the state architect's office in developing plans so that when we do ask for an appropriation, we will be able to proceed without any delay. The result of that delay last year was that our building was half completed and if we had had the architect's office with us, this delay would have been eliminated. I want to say this in conclusion: It is a matter I am very much interested in. There is only one way that you can make progress—efficient progress—in any measure that you desire to carry through. First of all, you must honestly believe in what you are doing, and when you honestly believe in what you are doing, fight for it to a finish. If I honestly believe what I am doing is right, I am going to fight to a finish regardless of what may happen to me publicly or otherwise. On the other hand, I want to say this: I don't believe any man has the right to deliberately set aside public opinion and set his own ideas up against public opinion, for it is going to work for the detriment of the community. Co-operative effort in everything is necessary to success. You are realizing it more and more, and the great war which we have just passed through impressed us with the necessity of a great democracy accomplishing purposes which mean something to the people. There is no use in any one man setting himself up as the savior of the people. There is no one man that knows everything. But one man may have thoughts, but in order to accomplish any purpose that he may have in mind, he must have the co-operation of the people for whom he wishes to work, otherwise he will never get anywhere. Just a few words more. I want to say that the work which is being done by the Commissioner of Horticulture is something that we people of California have good reason to feel proud of. And no man could have made the trip that we made yesterday and seen the work done by the University of California in co-operation with the United States Department of Agriculture and not feel proud of the men who are sincerely working in the interest of this state in doing scientific work which means so much to all of us. We must all feel proud of these organizations, these men, who are sincerely working for our interests to accomplish a purpose which will be of benefit to the man who is engaged in fruit growing and farming, to make money out of it. That is one thing that we must recognize in our scientific men. We often criticize them because we feel that they are not, in many instances, as familiar with practical matters as we are. But I want to tell you when you finally define all the ins and outs of the situation, and you analyze them, you begin to realize more forcibly that the thought and the scientific attainments which are put in charge of our work, if it is done conscientiously, mean much to the commercial interests of all.

The Chairman—We have enjoyed this splendid talk and if we had a little more time, I would suggest a discussion of it, but we must proceed first with the regular program. I will ask Mr. C. C. Teague, representative of the California Fruit Growers' Exchange, to address the Convention.

Mr. Teague—FELLOW FRUIT GROWERS AND FARMERS:

I feel that I am appearing before you somewhat under false pretenses. You will notice by consulting your program that Mr. Powell was to have addressed you, making a report on the activities of the California Fruit Growers' Exchange. No one can quite take Mr. Powell's place, as every

one who is here knows, and I have a good deal of diffidence in attempting to do so. But he 'phoned me at the last moment that he could not be here and that he was sending me a concise statement of some of the accomplishments and outstanding features of the activities of the exchange which he asked me to present. I could not help but feel, Mr. Chairman, as I listened to the addresses of welcome by our ex-ministers, the president of the chamber of commerce and the mayor, if I had had a few years' training in a Methodist pulpit, I then perhaps would not feel so diffident in this matter. I trust, however, under the circumstances, that you will extend to me the same sort of feeling that you would to the Ford when your high power car breaks down. I am particularly in a position, I think, to appreciate that feeling today, as I am 150 miles from home and my high power car did break down and a Ford would look mighty good to me. So I will hope to have you extend me that feeling.

I think, Mr. Chairman, that after hearing the eulogy of Mr. Roeding of our present Horticultural Commissioner and the statement of his hope that he would ultimately be the Director of Agriculture under our new law, I feel that it is not entirely inappropriate, and at the risk perhaps of divulging some confidences, that I shall state to you that I had the honor of being a member of the committee that called upon Governor Stephens when we learned of the passage of this bill and that it would probably be signed. Some twenty of us, feeling that this appointment of Director of Agriculture was so important to all of us interested in horticulture, called on Governor Stephens and urged that he appoint Commissioner Hecke as Director of Agriculture. He stated to us frankly and freely that he never had any other intention except to appoint Commissioner Hecke, and I am sure to take this occasion to congratulate him, fellow Fruit Growers and the State of California, in the selection of Mr. Hecke. It is seldom that we have a man who is willing, at the expense of almost an entire abandonment of his own private interests and his personal property, to devote his time and attention to the state welfare, and that is what Mr. Hecke is doing. He has made us a very efficient Commissioner, and I feel sure he will make us an efficient Director of Agriculture.

The responsibilities of the California Fruit Growers' Exchange, which has charge of the marketing of about 70 per cent of the orange crop of this great state, and from 85 per cent to 90 per cent of the lemon crop of this state—the responsibility of that organization, I say, is very great. It has a great many problems to meet with these rapidly increasing crops. I think perhaps the figures of the lemon business is a concrete illustration of what we have to meet in marketing these great crops. Ten years ago Sicily was supplying about two-thirds of the lemons that were consumed in the United States. Last year we had exactly, or almost exactly, changed places with Sicily and California was supplying two-thirds of the consumption of lemons in the United States; and for the year 1919 California will produce more lemons than ever were consumed in the United States in any one year. In other words, without the foreign product at all, we would have enough lemons to supply the markets of the United States. But the foreigner is not out. He is still coming. At the present time there is the usual supply of foreign lemons in this country, and it looks as if we will have to make the people of the United

States consume about 30 per cent more lemons between now and the first of September, than they ever did before, and it also looks as if we were going to do it. To accomplish these things, to take care of this greatly increased product, distribution must be highly organized. The California Fruit Growers' Exchange is attempting constantly to highly organize distribution. They are attempting in every possible way to increase consumption. The greatest thing that they have ever done in increasing consumption was the adoption of a national campaign of advertising. The Exchange determined some years ago that this great crop could not be handled without a national campaign of advertising, and that takes a lot of money. A national advertising campaign such as the exchanges are conducting can not be put over for less than $300,000 or $400,000. So you see you must have a large aggregation of fruit in order to spread that cost so that it will be a small item when it gets back to the producer. The present advertising cost when it gets back to the producer now is something like two cents a box, which is not a very large item, but this could not be done in any other way except by an organization controlling a large part of the fruit. While it is true that the general producer, whether he is a member of the Exchange or not, gets a large portion from the benefits of this national advertising campaign; that is inevitable. Still, the Exchange in the effort to get some of it to itself conceived and adopted the idea of a special brand—Sunkist Brand—which is now a household word. I think in order to get the points that Mr. Powell thinks are the outstanding points of the work of the Exchange, before you, I will read his concise and short statement here and perhaps make a few remarks that he has not fully covered.

(*Reads statement of Mr. G. Harold Powell as follows*):

"You all know that late in December we had a very severe frost. It was estimated that some 30 per cent of the citrus crop of California was either destroyed or seriously injured by the frost. It became evident immediately to the directors of the Exchange that they would have to take some steps to be certain that this Sunkist Brand would be protected, as we considered it one of our greatest assets. It is a well known fact that you must maintain any nationally advertised brand up to the standard advertised. If you don't, there is a kick-back. It sort of acts as a boomerang, and the money is worse than wasted. Therefore the Exchange immediately passed a resolution which said that if any shipper of fruit shipped fruit under the Sunkist Brand that did not come up to the regulation, he would be prohibited from shipping any more fruit under the Sunkist Brand until his orchards were inspected and until an inspection system could be installed which would prevent a recurrence. The agencies were also notified immediately to unpack any fruit that arrived and that did not come up to the standard. The Exchange immediately expanded the inspection department of the field department of the Exchange so as to provide an inspection system that would see to it that nothing but good fruit was packed, or that nearly as possibly, under Sunkist Brand. We are very glad to say that what might have been a disaster to our brand has resulted in placing it more strongly before the people than ever before and making it a greater asset than it ever has been before.

It is coming home to all of us in the Exchange work that there are great possibilities in increasing the efficiency of salesmanship in the handling of this fruit. For example, we have put on scouts who are traveling throughout the country, and they are showing merchants, for example, that instead of marketing fruit for sale at so much apiece, they would sell a great many more, by actual demonstration, if they were priced by the dozen, the tendency naturally being for people, where fruit is priced by the dozen, to take home a half a dozen or a dozen instead of perhaps two or three where it is sold by the piece. Actual demonstration work has proven that that little thing alone is a great factor in increasing the consumption of fruit—people taking more home with them. Another point that has yielded fine results—a tendency has been in some of the markets of the country for merchants to price their fruit too high—to put on too high a margin. We have gone in and demonstrated to the trade that by pricing low and making a low margin, in many cases they could sell four or five times, and sometimes as high as ten times, as much fruit at the lower margin than they were selling at the higher margin and that their profits would be greater even though their margins were one-half of what they were, which means cheaper fruit to the consumer, and of course, means larger consumption. Another thing has been the education of the trade as to how to properly display fruit. A great many of the public buy with their eye. If they pass a stand and see fruit attractively displayed, or a wholesale grocery store and see it attractively displayed, they will purchase where otherwise they would not. Photographs have been taken of the best display and then have been sent around to fix up the windows and teach the retailers of fruit how to attractively display their fruit, and it has worked out that if you show one merchant how to properly display his fruit in a town, pretty soon they are all properly displaying it, which greatly adds to the consumption.

It is a very unfortunate thing in the lemon business that about the only place where you could find a good drink of lemonade was in the saloon. The average stand that mixes soft drinks does not like to bother with making lemonade. It takes considerable time, and bottled juices have not yet been a success, and if you get it out of a bottle, it is usually citric acid, and not lemon juice. We like to see the lemon actually squeezed, and so it is very unfortunate that the only place you could get a lemonade has been in the saloon. I, for one, am very glad to see that the saloons are going out of business, notwithstanding the fact that up to the present time the saloon has been the biggest user of lemons, but no matter what happens to the lemon business, so far as I am concerned, I want to see them go out. But I have the faith, that with intense scout work and educational work, we may be able to teach the dispenser of cold drinks—soft drinks—that there is a good demand for lemonade. We propose to go into certain cities, and to establish stands there, if necessary to do it, at our own expense, and if possible, induce some men to make a specialty of serving lemon juice and orange juice. We believe there are great possibilities of increasing consumption everywhere under that systematic work along this line.

The selling of cull fruit has been in a very unfortunate situation, particularly in the south here. A large quantity of oranges and lemons are consumed by a great city like Los Angeles, and the practice has been in

the past for the peddlers to go out to the packing houses and gather up all sorts of stuff, regardless of whether it was fit for consumption or not. If it looked as if they could sell it, they would buy it, whether there was juice in it or not. If they could put it over, they would buy it. The intention of this department is to try to select the culls that are really good. We call them culls, but it is a low grade fruit that is really fit for consumption, but which will not stand shipment to the Eastern markets. But where it is put into a market near at hand it is just as good to use as any other fruit. The intention of the Exchange is to attempt to see that this low grade fruit that does get to our own people here, and there is a great market for it right here, is fruit that is really good to eat. A marmalade company was organized with the idea of taking care of some of this low grade fruit and making it of some profit to the producer instead of a loss. They started out very nicely, but the frost came along and the fruit was injured and there was a great deal of fruit put into marmalade or offered to factories; more than they would like to have. Their business has been expanded very rapidly. They have rather been wrong-end-to in the development of the business. It is usually good business to have a business grow with the demand. But here was an unusual condition which called for the manufacture of a large amount of marmalade in advance of the demand having been created. But the prospects of the business are very hopeful. The marmalade is being very favorably received. We get nothing but favorable comments as to its quality, and the sales are certainly as good as we could expect them to be at this time. However, at the end of the war, large quantities of marmalade were dumped back into this country that were off of the market, and it makes rather an over-supply at the present time. But those who are in best touch with the marmalade business are convinced that it will work out and be a permanent and valuable asset of the business. We had a great deal of difficulty in the early history of the by-products companies. Enough capital was furnished for the business to keep the capital in proportion to the shipments. Those who furnished the capital early, perhaps were later not the ones who were producing the fruit and it seemed very desirable to keep the capital and the production of fruit as nearly together as possible. So this unique plan of a revolving fund was proposed, by which the original capital put in will revolve back to those that put it in at a certain time. Every man will get his money back in about so long, and the present shippers put new money in. That period will perhaps revolve over a five-year term. We think it is a happy solution of the problem which has given us considerable trouble.

Realizing at the beginning of the season that the crop of lemons to move from California was almost equal to the total consumption of foreign and California lemons in any previous year, the Exchange launched a program to the extent of putting experts on the road to study the situation in small markets and in different parts of the country, and to stabilize the market, giving the trade confidence, and enabling them to move a large volume of fruit at a reasonable margin. The Exchange has endeavored to keep a steady supply of fruit moving to the markets of the country, preventing gluts in one market and shortages in others. The large volume of fruit moved under unfavorable weather conditions is a favorable indication of what may be accomplished."

Before closing, I should like to call your attention to what seems to me to have been one of the best demonstrations of co-operation in selling farm products that we have ever had, and that is the lima bean situation. We had at the close of the war a high price on lima beans. They were high in common with other products. Many thought that the war was to go on indefinitely and that the prices were high, but probably were warranted, as high as they were. But with the signing of the armistice we were confronted with a rapidly declining market on bean products. The bean production had been stimulated, due to the request of the government and the activities of the government and our state universities and others, and the bean production was greatly stimulated and we produced many more beans than we ever produced before. This rapidly declining market created a deplorable condition in the bean business. The situation was that you could hardly give beans away. The market rapidly declined until it was down to a 6-cent level and no sales being made. You could not sell beans freely offered at 6 cents, the trade being afraid to buy, fearing that they could not get out from under any purchase they might make without a loss. The best months had already passed and it looked as though we were going to be confronted in the bean business with a carry-over that would perhaps cause a low and demoralized market for years to come. As I say, beans were being offered at prices which were lower than pre-war prices, and still they could not sell them, when they took into consideration the differences in the cost of production. After considering this matter, the bean growers of southern California decided to form a selling agency. They appointed an executive committee of nine men who were to have charge of the selling of these beans—safely 80 per cent of the beans on hand in California, unsold. The owners of those lima beans signed an agreement placing the beans in the hands of the executive committee with full power to sell them as they should see fit. They pooled them in a common pool and established a grade, and all sorts of ideas prevailed as to what was a standard. Even those that had attempted to ship had their shipments turned down on account of quality. When a market is declining the quality is always wrong. So these beans were signed in this agreement and a manager was appointed and the beans offered for sale. The opening price was 6¾ cents, which at that time was ¾ of a cent above the prices at which beans were freely offered with no takers. The owners of these beans guaranteed the price against their own decline for a period of four months. I would like to read to you the result of this campaign. There was in the selling agreement 664 carloads of beans besides seed that the growers expected to need, or some 400,000 bags. The opening price was $6.75 and within two days 214 carloads of beans were sold. It then became apparent that more beans were sold than could be shipped for perhaps 30 days, and gotten in shape. So quotations were withdrawn for a short time. Then they were again offered at $7.25 and 86 cars were sold at $7.25. The price was then advanced to $7.50 a hundred and 114 cars were sold. The price was advanced to 8 cents, the present price, and 35 cars have been sold, or a total sale of 58 cars, which is 80 per cent of all the beans in the selling agency in less than two months selling campaign. The present 8-cent price is entirely justified in comparison with all other food products, and in comparison with the increased cost of producing beans.

In closing, I should like to leave with this Convention this thought: in my judgment, it is only through the development of co-operative selling organizations that the farm products can be successfully distributed upon a basis which will yield a reasonable compensation to the producer and at the same time, through the elimination of speculation and through the elimination of extra costs and high costs of handling and high costs of selling between the producer and consumer, that will also give the consumer his product at a fair price.

The Chairman—Both the speakers this morning have taken the opportunity of touching upon the proposed new Department of Agriculture. I want to express my appreciation of the good words they have said in my behalf. A good many years ago I was a member of the United States Department of Agriculture and met with a great many earnest workers. When I left the Department of Agriculture and became a farmer in California I never was able to forget the germ of co-operation; and when Governor Johnson called upon me to take the Commissionership of Horticulture, I gladly consented, and if Governor Stephens tenders me the office of Director of Agriculture, I will accept it and exert the very best there is in me to advance the interest of the farmers of California.

Let me call to your attention the need of being here this afternoon punctually at 1.30. Mr. Teague is going to preside, and Mr. F. B. McKevitt's address will be the first one given this afternoon. The members of the Interstate Plant Quarantine Committee will meet at noon and Mr. Maskew advises them to go to lunch together as soon as possible.

We will adjourn now until 1.30 this afternoon.

Wednesday, May 28, 1919.

Afternoon Session.

Mr. C. C. Teague, presiding.

Meeting called to order at 1.30 p.m.

Chairman Teague—Commissioner Hecke suggests that I invite the audience to come forward and occupy some of these more comfortable seats further forward. Unless the speakers have strong voices, you may not hear everything. There is room up in front here. We seem to be rather slow in assembling, but we can not delay any longer in starting.

I am very much pleased to preside over this Convention this afternoon, particularly so as there are so many subjects and reports on co-operation in which I have been so much interested for many years.

The first speaker on the program is a man who has been very prominent in the northern part of our state in all of the activities connected with farmers, farm life and marketing, and I take pleasure in introducing Mr. F. B. McKevitt, President of the California Fruit Distributors of Sacramento.

Mr. F. B. McKevitt—Mr. Chairman and Fellow Growers:

I feel that it is a misnomer for your chairman to have given me credit for making a speech or an address this afternoon, since I have nothing to do but to read a very ordinary paper. I am glad to have the oppor-

tunity to do this, because it has become sort of a habit with me to come to these Fruit Growers' Conventions, and I feel so much at home there that I really would be lonesome if I did not attend and say a few words to you on such occasions. I have no particular message to give to you today, but I would like to say this: There are some things of interest which I think should be considered by this Convention later on, and I would like to ask permission at this time that at some future session I have an opportunity to talk a little bit to you on the labor situation. That is something on which perhaps I may be considered something of a crank, because we have been working at that more or less for the last four years. It seems to me that the subject is still a very live one, and in order that it will surely come before the convention, I would like to ask permission some time a little later on to take up the subject very briefly.

The Chairman—We will be very glad to hear from you.

(*Mr. McKevitt reads as follows*):

CALIFORNIA FRUIT DISTRIBUTORS.

By F. B. McKevitt, Sacramento, California.

The California Fruit Distributors has no detailed report to offer. In general it may be said that the Eastern fruit shipping business of California during 1918 was of the largest volume, and yielded the best returns of any crop in the history of the state. Generally speaking, the crop was unusually good, despite the fact that both rainfall and snowfall were very light, in the nonirrigated sections resulting in drouth and in most irrigated sections a comparative shortage of water. Under these circumstances it is a very remarkable fact that this was the third large fruit crop in succession produced by this state, and, more remarkable still, that each crop was marketed at considerably increased prices over any previous season.

Not as a report of the Distributors but as covering the general shipments of the state, and merely for the purpose of making it of record in the proceedings of this Convention, I will refer briefly to the shipment of the different varieties of fruit commonly forwarded.

CHERRY SHIPMENTS.

The cherry shipment for the season was 356 cars, a small increase over the shipments for 1917. Generally speaking, the cherry crop was very light, and was of fair proportions only in the Santa Clara Valley. While the fruit was of but fair quality, prices, owing to the scarcity and great demand, were very good.

APRICOT PRODUCTION.

Apricots to the amount of 440 cars were shipped, being a small advance over the forwardings of 1917. Shipping cots were probably more affected by the drouth than most other fruits, owing to the fact that the great bulk of this variety used for shipping comes from the Vacaville and Winters districts, where the effects of the drouth were most apparent. As was the case with the cherries, the demand for cots was unusually good and prices fine.

THE DEMAND FOR PEACHES.

Of peaches we shipped 3,136 cars, about 700 more than for the previous season. The Eastern fruit crop, especially peaches, was unusually light, and this created a very strong demand for our product. Very heavy shipments were made from the San Joaquin Valley, and as usual practically the entire crop of the Northern districts, notably Placer County, Suisun and Vacaville, went forward. The quality of the fruit was not quite up to standard, but that from Placer County, where water for irrigating was available throughout the season, was of their usual fine color and quality.

THE PLUM MARKET.

Plum shipments were 2,493 cars, about 200 cars less than the year previous. This difference in shipments was due almost entirely to the difference in size of the fruit, occasioned by the drouth. The plum market was very strong throughout the season, owing not only to the generally favorable conditions of the market but especially because of the fact that the great private sale markets of the West have become educated to the value of our fancy varieties of plums and are now heavy consumers of same. It is only a few years ago that the West bought practically none of our plums, and the plum growers of the state, seeing their product rapidly increasing, felt very anxious as to the future. However, that anxiety has now entirely passed away as the demand from the West and new consuming centers are calling for continually increasing supplies. Without doubt California produces the finest plums grown in this country, and as in many sections of the East they are not grown at all on account of curculio and other pests, the future of this line of industry in California seems most encouraging. Several new and early varieties of Japanese plums have been introduced and are being tried out, some of them being especially promising. It is too early at this time to determine just what their future will be and this information will necessarily come in future reports.

THE PEAR MOVEMENT.

Pear shipments were 4,571 cars, or about 300 cars less than for the previous year. The quality of the fruit, generally speaking, was fine, owing largely to the fact that the great bulk of the crop is produced on the moist lands along the Sacramento River. Pears grown in the interior, where drouth affected them, were naturally considerably smaller, and, as was the case with plums, the decline in shipment can probably be attributed to the smaller size of the fruit. Prices left nothing to be desired so far as the great majority of shipments were concerned, there being but one comparative weakness, and that at the time of the heavy arrivals of Northwest fruit.

VIGOROUS GRAPE DEMAND.

Grape shipments showed a total of 16,358 cars, a gain of more than 3,000 cars over the previous year. The heavy rain which fell in September probably reduced the shipments by 1,500 to 2,000 carloads. Heavy purchases of wine grapes by Eastern interests were made early in the season, and it is estimated that about 6,000 carloads of these grapes were shipped from the state. This particular branch of the business was very heavily affected by the storm just mentioned. While there were thousands of carloads of table grapes shipped after the storm, and showing but little effect of it, wine grapes were seriously injured, so much so that the shipment of some varieties was entirely suspended. This is particularly true of the Zinfandel. In some sections of the state as much as six inches of rainfall was recorded for this September storm and it seemed almost impossible that table grapes which had gone through such a severe storm would be worth picking. Fortunately, however, this proved not to be the case, and a few days after the clouds had gone by shipments were going forward as usual. While these later shipments did not go through in perfect condition, they were good enough to command the highest prices paid for this product during the last twenty years. A comparatively small amount of damage resulted in the Fresno district, as showers there were very light. The moist weather, however, which continued for about a week, did some damage even there, affecting very badly that part of the Emperor crop which was to be used for packing in sawdust. Large quantities of Malagas and Emperors for the table were forwarded in small lug boxes, meeting with strong demand and satisfactory prices. Emperors packed in drums brought very high figures, and where the fruit was sound and entirely free from rain damage, proved very satisfactory and made money for their purchasers. Californians are not able to understand the exceedingly strong demand that has sprung up in the last two or three years for our grapes, but the fact remains that this demand exists, and it is bringing a golden harvest to the growers of this state. While the grape output is now large, it will constantly increase as many thousands of acres of new vines have been put out in the last five years and will soon be in full and heavy bearing. Some anxiety has been occasioned to the Emperor grape growers because of this fact, but the future of this variety when well grown, well selected and free from rain damage would

seem to be most promising. At the present time we are seeking a market in our own country only for this product, but there is no question but that fine fruit, carefully packed, can be shipped practically all over the world, and we confidently expect that within the next two or three years we will be sending very considerable quantities of Emperors, and possibly Malagas, to Australia, New Zealand, South America and even Europe. Eastern dealers tell us that they prefer the first-class Emperor to the imported Almeria, which has held the winter markets of the great cities of the world for many years. If we can make this grape as popular in Europe as it is in our own country there will be little fear of planting too many Emperor grapes. In addition to this variety there are two or three others being developed by Mr. Cunningham of the American River district near Sacramento which promise to be even better, and we can reasonably expect with the coming years new varieties especially adapted to the soil and climate will be found so that the grape season for other varieties may be indefinitely extended.

LABOR DIFFICULTIES.

The season was distinguished for the shortage and high prices of labor. Growers, however, were able by reason of the long season to save their crops, and because of the high prices obtained for same, were able to meet the cost of labor and have something left. Little difficulty was experienced in securing sufficient supplies of lumber for our fruit containers, but owing to the exceedingly large demand for small grape containers there was a shortage of five-pound baskets, necessitating bringing in considerable supplies from outside the state.

TRANSPORTATION.

Transportation was in the hands of the United States Government. Schedules were considerably longer than when the rails were under private management, averaging about two days longer than formerly. In addition to the lengthened schedule, our business was arbitrarily assessed and taxed 25 per cent on freight, which was in addition to the war tax of $10.00 per car. The high price received for all our products enabled us to meet this increased cost without any noticeable harm, but the rate is altogether too high, and can not be maintained in times of peace, provided there is any decline in the selling values of fruit.

MARKETING FRUITS.

The government is now taking a great interest in the marketing of fruits and the Department of Agriculture is sending out to growers and shippers a large amount of information which is of considerable value if properly applied. A system of inspection has also been devised whereby shipments of fruit which are rejected by dealers may be inspected and passed upon by disinterested parties, offering protection to both buyer and seller. A complete and honest system of this kind has long been needed, and if it is properly conducted will be of great benefit to the industry at large. However, in the season just passed, this inspection was not at all favorable to California growers, as the inspectors were almost invariably chosen from the ranks of Eastern dealers and any authority called upon to pass upon condition and quality of fruit would be an interested Eastern dealer or his employee. This is anything but fair and will never be satisfactory until placed upon an entirely different and unprejudiced basis.

The inadequacy of the Erie Pier to properly receive and care for the great shipments of California and Northwestern fruits in New York was demonstrated in a more striking manner than ever this season. It is a great problem to know how to handle this situation. There is a limit to the capacity of the Erie Pier; there seems to be no limit to the capacity of the Pacific Coast states to forward fruit. The New York trade demands sales on the Erie Pier, as it is the most central and accessible point for them. The Erie service up to the last two years has been entirely satisfactory and there is no desire to make a change. However, it will be necessary to take some radical steps in the very near future or we will find that the entire distributing system for New York will break under the strain and hundreds of thousands of dollars will be lost to our shippers.

SUMMARY, SEASON NINETEEN HUNDRED EIGHTEEN.

As has been previously stated, the season of 1918 will go into history as the best and most profitable one that California has ever known. Up to the

September rain prospects for 1919 were very poor. In the nonirrigated districts there were plenty of buds on the trees but they were all very poorly developed, and had it not been for that opportune rainfall it is undoubtedly a fact that the crop for the coming year would have been, in many localities at least, a complete failure. The rapidity with which buds swelled and trees took on a new lease of life after that storm is an object lesson as to the benefits to our orchards of a copious irrigation at that season of the year. Care must be taken, however, not to make the application late enough to force out a new growth on the orchards, as was the case several years ago when we had a similar visitation. At the close of the season of 1918 prospects for all kinds of fruits were very good. A heavy bloom was indicated and at that time another full crop was in evidence. Although the season of 1919 is now several months old, it is not proper at this time and place to say anything further in connection with the outlook, as that will properly follow in the review of the season next December.

The Chairman—About how long a time would you like to occupy with this labor question?

Mr. McKevitt—About ten minutes.

The Chairman—I think we could spare the time now while you are on your feet and we are all very much interested in that question.

Mr. McKevitt—The reason I wish to take this opportunity is because of the articles I see almost every day in the press relating to the great bond issues which are being floated all over the country for the purpose of highway building in order that the returning soldiers may find occupation, the inference being that there is not work enough to keep those men employed and that we have to create extra work for that purpose. I want to call attention to the fact that before the war there was a shortage of labor all over the United States. It was worse in the East than in the West. I know farmers who were unable to get help at anything like wages that could be paid. In California we met the situation with higher wages and were able to take care of our crops. But the shortage still exists. It would have been impossible last year to harvest our crops had it not been for the patriotic effort which was made by the young women of the state, and our schools and universities using their influence with their classes to get those young women to go out into the country as a matter of patriotism to save the crops, which they did, and which undoubtedly resulted in saving crops which would have been wasted. It is true that our women are disbanding and some of our boys coming home. A million of them have come back and have been absorbed into the industry of the country. There are seven or eight hundred thousand more to come, and if they are willing to work on the farms and the ranches, there is not any question but what they will be absorbed. But what I want to say is this: the war, with loss of life in the field and in the hospitals from sickness and other causes, has left us short of man-power. We were short before the war. In addition to that, owing to the operation of the laws of prohibition which are about to be enforced in this country, we are informed by the government itself that in the neighborhood of 130,000 aliens are preparing to leave the country. They are selling their possessions and putting everything into coin. They are going back to the old country where they can have what they call freedom of action. If that many aliens of the working classes are taken away, I want to ask where we will get sufficient help to move our crops. We come right back to the proposition that was before us a year ago. If we can not get the women and children to help, hundreds of thousands of tons of California fruit will go to waste, and I want to

bring this subject up at this time, not to publish the fact broadcast that there is a shortage of labor in this country and so raise the exorbitant prices still higher, but to call the attention of the people in the mountains and country districts, that there is labor for them in the fruit districts and get them to move into the districts with their families to help us to take care of our crops. I simply wanted to bring the question up for your consideration, so that this Convention, if it believes there is anything in the idea, can take the proper steps to see that the fact is advertised throughout the state that there is work for every one, and get them to come where the work is waiting for them.

The Secretary—Commissioner Hecke has appointed the following committee on resolutions: George Pierce, D. D. Sharp, F. B. McKevitt, C. B. Messenger and C. Thorpe. Anyone having resolutions should submit them to the committee.

The Chairman—Next on the program is an address on "The Use and Value of Crop Estimates," by E. E. Kaufman, United States Department of Agriculture, San Francisco.

Mr. Kaufman—MR. CHAIRMAN, LADIES AND GENTLEMEN:

The subject that I am to present to you this afternoon is such a large one, with so many ramifications as to the methods of making crop estimates and interpreting the report that is issued, besides the use and value of acreage data and things of that kind, that I concluded to write out a paper so that I could confine my remarks to one broad line; and then, also, Mr. Hecke insisted that 20 minutes was the limit which could be given to the consideration of this subject.

(*Reads paper as follows*):

THE USE AND VALUE OF CROP ESTIMATES.

E. E. KAUFMAN, Bureau of Crop Estimates, San Francisco, California.

CALIFORNIA DEPENDS UPON AGRICULTURE.

Agriculture and its complement, horticulture, is without question the most important industry in California. Its mining, its commerce, its great business future and even its wonderful climate are practically dependent on agriculture. That may sound like a paradoxical statement, but while climate is the direct cause of our superior agriculture, without the agriculture there would be little inducement to populate this great state, for, while we all admit it is the best on earth, man can not live by climate alone. The total value to the grower of California's crops in each of the last two years was more than $400,000,000, with an excellent prospect at the present time of adding another $100,000,000 to the total for this year.

THE NEW AGRICULTURAL ERA.

Old-time methods of agriculture, wherein the farmer farmed as did his father before him—everyone for himself and "the devil take the hindmost"—have given way to newer and better methods in which organization and co-operation are the most prominent factors.

Consumers must be found for the products of the soil. In the process of locating consumers, or markets, if you please, it becomes necessary to know something about the probable production of the various crops grown in the immediate locality as well as more distant sections where competition was likely to develop. Just as it is necessary for a great firm like the Steel Corporation to know where its raw materials can be obtained, the time and cost to transport them to the mills, the cost to the smallest item of turning out a finished product and also to a reasonable extent the production cost of its most active competitor, so it becomes

necessary for the manufacturer of crops to have more or less reliable estimates of the production of all such crops he may be growing in competition with his neighbors and fellow-farmers in neighboring states. From these necessities there has arisen an incessant demand for crop estimates and statistics of acreage, yield and production, particularly the past few years, when America was called upon to feed the world.

RELATION OF PRODUCTION TO TRANSPORTATION.

Transportation companies want to know the probable production in order properly to provide for the means of a rapid and economical movement. Banks and financial institutions want to know the probable production in order to properly supply the money and credit to bring about a rapid and economical movement. Dealers and distributors want to know the probable production, that they may buy and sell to the best possible advantage, and lastly the ultimate consumer wants to know the probable production in order to purchase at the lowest possible price within reason the necessary food for himself and family.

Many private corporations collect for their own benefit information concerning the condition and probable production of all crops in which they are particularly interested, but such estimates rarely reach the public in time or form to be of direct benefit to the producer or consumer, and since such corporation would have some particular interest in these reports they are not generally accepted as being entirely of a disinterested nature and free from bias, as are similar reports made by some governmental agency.

THE WORK OF THE U. S. BUREAU OF CROP ESTIMATES.

Estimates of crop production throughout the different states have been made by the Bureau of Crop Estimates, United States Department of Agriculture, for more than fifty years. From small beginnings covering only the great staples like corn, wheat, oats and cotton, the system has been gradually extended to cover more than seventy different crops, and, by the way, nearly all of them are grown to some extent in California.

At the present time more than 200,000 voluntary crop reporters throughout the nation are supplying data upon which are based the government crop reports. The present organization of the Bureau of Crop Estimates was effected in 1914 and is made up of a trained field agent or agents in each state, who devotes his entire time and attention to collecting information concerning crop conditions through a large corps of voluntary reporters, by personal investigations and interviews with farmers and others having an interest in agriculture, and then tabulating and transmitting these data to Washington for review by the statisticians of the bureau and finally interpreting, as far as possible, the findings into estimates of probable production for the benefit of all the people in the state who care for the information.

The laws provide that anyone connected with the Department of Agriculture concerned in any way in making crop reports is prohibited from speculating in products of the soil and from giving directly or indirectly to anyone information relating to crop conditions before the time and data stated for the issuance of such reports by the Secretary of Agriculture, thus making the bureau's reports both disinterested and free from bias.

CALIFORNIA CROP REPORTING.

In California nearly 2,000 voluntary crop reporters—mostly growers—are on the regular and special lists, besides practically all the various farm and fruit associations, county agents and horticultural commissioners, in some form or other, furnish reports to the bureau and its field agents from time to time concerning the condition of the crops, number and condition of the different classes of live stock, prices paid growers and much other information that when properly tabulated supplies a mass of statistical data relating to the agricultural resources of the state, which is of inestimable value in the proper tabulation and interpretation of reports month by month and particularly in the final estimates on production in December of each year.

Heretofore the bureau's estimates have been based on the state as a unit, but for the last few years, and particularly when the United States Food Administration became active, there has been an almost insistent demand for the reports

to be reduced to a county basis. California, with her 800 miles of latitude, 500 miles of longitude, and nearly 3 miles of altitude, with her varied soil and climatic conditions causing the specializing of certain crops in different counties and even different districts in the same county, is particularly situated to require crop reporting to be done on the basis of the county as the unit, or at least the district as the unit, and before the present season has passed it is expected that forecasts of the probable production of some crops will be made by counties and districts. It is really more important that the bean grower in Yolo County know the condition of the bean crop in Santa Barbara County and what it portends, than that he know the condition in Colorado and Michigan. The same can be said of most of our fruits and other crops peculiar to the state. To give the grower primarily, and all others indirectly, the fullest possible measure of crop estimates it is therefore necessary to make the reports cover a smaller unit than the state.

This brings me to the real part of my discussion of the use and value of crop estimates before this Fruit Growers' Convention, and led me in a talk with Mr. Hecke to suggest that I be given a place on the program for this meeting, because I wish to enlist you one and all in a propaganda to secure better and more reliable basic data for making crop estimates.

PRODUCTON ESTIMATES DEPENDENT ON ACREAGE FIGURES.

The weakest point in all crop estimates is the acreage data which in a way supplies the base upon which the estimate is made. With a large number of reports from well-informed growers and others interested from a given county or district, and the law of averages to smooth out the irregularities, experience has proven that it is possible to estimate the average yield with a great degree of accuracy. The total production then is dependent upon the accuracy of the acreage estimates.

Starting with census data, the increase or decrease from year to year is calculated from reports made in the same manner as for condition and yield, to which the law of averages is applied in addition to checks against the assessors' reports; thousands of reports from individual farmers as to their respective plantings and many other schemes devised by statisticians, and yet the fact remains that there is not the confidence in the acreage figure that pertains to the estimate of yield per acre.

That a new acreage base must be established each year, and ever so slight an error in the year following the original base—the census—becomes cumulative and of considerable importance before another accurate base year has been reached. It can be said, nevertheless, that notwithstanding these very noticeable chances for error, the acreage data of the bureau are by far the most reliable anywhere to be obtained, and generally so accepted.

The remedy is self-evident. A census of the acreage planted to the different crops each year, as well as a census of the number of fruit trees in bearing, and of the different classes of live stock. At first thought a yearly census seems both impractical and impossible, and would be, along the lines of the present United States census. Experience has proven that the present methods of the bureau in estimating average yields per acre and prices, are accurate enough for all practical purposes, for as a matter of fact census figures are really only estimates made by the grower six months after harvest. Acreage data is then all that is really required in an agricultural census.

CENSUS OF NINETEEN HUNDRED TWENTY.

The census of 1920 will eliminate prices in the agricultural statistics and the valuation of all crops will be calculated on the basis of price figures obtained by the Bureau of Crop Estimates.

The value of agricultural data was early recognized and most states of the Union placed on their statute books provisions for collecting acreage data, but in too many instances they were more or less ignored or only partially enforced, and consequently poor results obtained. California has a law for the collection of acreage data by assessors on all crops and fruits that is beautiful in theory but impractical, and through the present system of operation is a huge joke. Solano County, for example, reported through its assessor in 1916 some 50,000 more acres planted to crops of all kinds than there actually are acres of land in

the county. In Los Angeles County the assessor in 1910 reported the number of bearing orange trees to be 2,531,483, while in 1918 the number in bearing is returned at 563,849, or only 22 per cent as many oranges in bearing in 1918 as in 1909. To intimate that in the past eight years there had been a decrease in the number of orange trees in Los Angeles County would incite most any Angeleno to murder, and yet the assessors' figures are the only simon-pure official records of acreage data to be obtained anywhere in the state. It is certainly quite noticeable that chambers of commerce do not quote such figures in citing the wonderful development that has taken place in their respective counties.

These facts are not stated as a criticism of the assessors so much as against the present system, or, if you please, lack of system.

CROP ACREAGES BASED ON ASSESSORS' RETURNS.

A number of states, notably Kansas, Wisconsin, Ohio and Missouri, now have assessors' returns on crop acreages every year that are fully as dependable as those of the census.

The theory of assessing property in California, by which the taxpayer is supposed to voluntarily submit a statement of his taxable property, and also the lack of uniformity in the various counties in securing statements from the taxpayers, are some of the handicaps to securing reliable agricultural data at the present time, but I believe there is enough ingenuity somewhere concealed about the person of California's assessors to devise ways and means to do what is being done by a similar body of officials in other states.

The reasons for stating that the county assessor and his deputies is the best possible agency for obtaining detailed statistics concerning the agricultural industry can be briefly stated. His work is not only of a permanent nature but universal as well, reaching into all the different counties of the state and every section of each county. He is in touch with every phase of agriculture, whether it be that of the stockman, orchardist, vineyardist, or just the plain, everyday farmer. He is required to go over the ground annually in connection with the duties of making the necessary tax valuation, and receives just compensation under the state law for the work performed.

One of the principal objections by the assessor to this method of gathering agricultural statistics is that it interferes more or less with the proper assessment of property, and while of course this may be true to some extent, it has been largely overcome in various states of the Union and undoubtedly can be in California.

The main difficulty seems to be that the farm or ranch is not always visited, and the operator must be seen or the information secured through other sources, which is not always convenient. Neither is every assessor interested in securing this data, and the taxpayer is not always inclined to answer the questions satisfactorily.

A number of remedies might be proposed which would make returns from assessors more complete and accurate. The farmer might be compelled to fill out the blank properly, including statistics of agriculture, under penalty of percentage of increase to be added to his assessment as determined by the assessor. The payment in whole or in part for services as assessor or deputy could be withheld until he can present a certificate from the proper official showing the receipt by the latter of the required agricultural statistics complete and in proper form.

The proper state official should furnish the necessary form of tabulation sheet upon which the original data could be entered by the assessor or his deputy, either after a personal visit or inquiry or from the report furnished by the owner or operator, and if in the discretion of the state official it was thought advisable, a different form of tabulation sheet for the different sections of the state could be supplied. The original sheets that would thus be prepared by the assessor or his deputy should be sent to some state official for examination and check with the returns of the previous year, and also for computation of the totals, thus relieving the assessor of this extra burden and assuring more accurate work and less delay in working out the results.

The work of handling the original tabulation sheets and computing the results could be done in a most satisfactory manner by some state agency having a vital interest in agricultural statistics. Clerks trained in statistical work would thus relieve the assessor and his deputies from this very burdensome task. If no

particular state agency was available to handle the work of statistics relating to the various crops, it would be easy to provide for some form of co-operation between different branches of the state government interested in the data, by combining all such activities, and also for some more or less complete form of co-operation and possibly joint reporting by the state and federal offices interested.

It is believed that in some such manner, with very little extra expense and labor, statistics relating to the acreage of all crops grown in California could be secured annually, which would be fully as dependable as those of the United States decennial census, and combined with the improved methods of estimating the condition of the growing crops, yields and prices, a reliable report could be made each year concerning the production and valuation of all the major and minor crops of the state by counties.

The Chairman—The California Fruit Exchange is one of the successful co-operative organizations handling deciduous fruits. We are fortunate in having with us George E. Cutter, its president, who has had a great deal to do with its organization and handling. I present to you Mr. George E. Cutter.

Mr. Cutter—MR. CHAIRMAN, LADIES AND GENTLEMEN:

Just why Commissioner Hecke assigned to me "Co-operative Marketing," I have not yet quite solved. He wanted me to talk on co-operation and I am going to refer you to his program that he has got up, and take and check it over. I find that there are twelve co-operative organizations to address you in this Convention. Each one has a method of its own. So that if I were to give you my ideas, or go into detail as to our methods, it would partially fit our case. I will state that we changed our methods as we had time to work them over year by year for the last eighteen years. I do not believe that any advocate of co-operation after he has been handling the subject for a term of years, would have the courage to offer you any cut and dried plan of co-operation. Therefore, I have condensed my remarks to a few concrete, basic principles and if they are not elaborate enough, when I get through or during the session, we can discuss them a little further.

(*Mr. Cutter reads his paper as follows*):

THE CALIFORNIA FRUIT EXCHANGE.

By GEO. H. CUTTER, Sacramento, California.

In looking back over the work of the California Fruit Exchange, little did I realize, as I sat in the Convention of the growers of the state at Fresno, nineteen years ago, at which time resolutions were adopted to formulate plans by which a growers' marketing organization could be created, that I would, at this distant date be addressing a like convention and making a report of the activities of that marketing organization.

During the nineteen years, I have been associated with this Exchange from an association manager to president. One cannot be associated with such a movement without having certain basic principles inground in him; however, I am not going to touch upon the principles of co-operation—the theories are many, and one is quite as good as another, so long as it is followed consistently along business lines.

This organization has always worked along the lines of adapting itself to existing conditions, endeavoring never to disturb trade conditions and recognizing that commercial companies work for a profit, which all lines of trade should enjoy.

CO-OPERATIVE MARKETING.

With the Exchange, this so-called profit represents the earnings that accrue during the season's operations over and above the cost of marketing, and deposited in a working fund, which is automatically and eventually refunded to the grower on the basis of his shipments. We realize that there will always be two sides to the question, and we must meet opposition, but we feel that the larger we grow, the better opportunity we will have of controlling markets, stabilizing conditions, and more equitably distributing our products, until such time as the distribution of fruit is regulated by organized control.

GROWTH OF THE ORGANIZATION.

Reporting on the year's business for the Exchange, would say that in these nineteen years our shipments have grown from 200 cars to 4,064 cars, deliveries being made about equally between the auction and private sales markets. We are selling in eleven auction and about 167 private sales markets.

The total sales for the past year amounted to $7,234,241, which figures $2,750,000 over the previous year's business. The net returns exceed those of the previous year by $1,755,600. The saving, or refund to the growers, for the past season's business, amounted to $305,115, or 4.47 per cent, which reduced the cost of handling to 2.53 per cent.

The Exchange shipments, in comparison with the shipments of deciduous fruit, exclusive of wine grapes, represents about 27 per cent of the state's shipments.

Our supply department, purchased $610,000 worth of supplies and materials during the past year, at a big saving to the grower in the difference between wholesale and retail prices.

The traffic department has filed claims with the various carriers in the amount of $135,000, and up to date has collected some $80,000 of this amount, which has been paid to the members.

ACCRUED RESULTS.

The growers of the state have realized the highest prices in the history of the fruit industry, for their products, during the past season, while at the same time the cost of production and marketing, including an advance in freight rates, has been much greater.

The railroad service was not all that could be wished for, but it was all that could be expected under war conditions. The future of the fruit industry is bright, and with normal traffic conditions, which will enable us to deliver our fruit on schedule, thus avoiding decay and gluts in the Eastern market, and with the results of standardization, which will bring the fruit and pack nearer to 100 per cent, and the widening of our markets, much will be accomplished for the good of the grower.

In conclusion, I would say that part of our success is due to our affiliation with the California Fruit Growers' Exchange, which was our advisor and supporter in the early days of this Exchange.

The Chairman—I see we have on the program a report from the California Associated Raisin Committee, although there is no one down on the program to give the report. Is there anyone here prepared to report for them?

(*No answer.*)

The Chairman—The Almond Growers' Exchange is one of the successful marketing organizations, marketing a large percentage of the almond crop of the state. We are fortunate in having with us the president of that organization, and it gives me great pleasure to introduce to you Mr. George W. Pierce, the president of the Almond Growers' Association.

Mr. Pierce—MR. CHAIRMAN, AND LADIES AND GENTLEMEN:

The California production of almonds is increasing rapidly. It is one of the most recent additions we have to the large crop productions in our state. I do not mean by that that we have just begun to cultivate the almond, because it is one that has been cultivated ever since the state was discovered. I might say that it was introduced here, and I presume I have as good authority for saying that as many have for saying it was introduced at other times. But I say it may have been brought here by the Mission fathers, and I think perhaps here, where we have so much to remind us of what those fathers did, is a good time to make the statement that I believe it was brought here by the Mission fathers. For a long time it assumed no commercial importance because of the fact that the almond is a very particular sort of a product as to soil and climate required for successful cultivation. A tree, as a tree, will not always grow in any locality where any tree will grow. To be a commercial success, it depends on so many things that it has taken years to ascertain just what the conditions are and we have had to study them through a long series of years without very much help from the outside, and it has taken a good while to realize that while California can produce almonds sufficient to supply the entire United States, it must have concerted thought and study. California today produces about one-quarter of the almonds that are consumed in the United States. The remainder comes to us from Mediterranean ports, chiefly from Spain and the adjacent islands, which produce the best almonds that are imported into the United States. With these, the California almond, until a very few years ago, was only second. It was second best in the markets of the East. Through the work of the organization brought about by California almond growers, a right careful study has been given to the preparation and marketing of the almond. A right careful study has also been given to the proper distribution and to the growth of certain varieties.

We have today arrived at a point where the California almond stands first in the markets of the East. This is one of the direct benefits brought about by co-operation. California, now in a very short time, will be supplying the entire United States. We will be in the same position as was told here this morning in regard to the lemon growers of the State of California. However, if we are to do that, there are certain principles which we must follow, and there is a certain amount of legislation which must come to us to aid us in its fight for the markets of America.

California is the only state in the union that produces almonds on a commercial basis. Texas and Arizona made the attempt, but today they are out of the business and ship no almonds whatever. Even in California, locality has much to do with the size and color and quality of the almond. Notwithstanding these many restrictions, almonds are grown in California from Riverside on the south to Tehama on the north, and they are grown very successfully in many regions between those two points.

However, the great almond growing section of California is in the great central valleys of the state, the San Joaquin and Sacramento. If we were to take the state capitol at Sacramento as a pivotal point and

describe a circle with a radius of 150 miles, we would have within the circle thus described the area representing about 90 per cent or 95 per cent of the production of almonds in the State of California.

The annual production of almonds in California has ranged in the last few years from three thousand to five thousand tons. This has gone up rapidly from the production of twenty years ago of less than a thousand tons. We have had a great deal of benefit from the work of the University of California. They have aided us along many lines pertaining to the cultural development of the almond and yet there are a great many things that we still need information upon, and I think the University of California is in a position now to take this matter up with renewed effort.

We have been neglected by the federal government. The federal government has done but very little, and the appropriations that have been made by congress for the last few years for almond culture have all been diverted to other lines. The pecan industry at the last session of congress succeeded in manipulating matters so that the entire appropriation was used for investigation work along the lines of the pecan industry. There is, however, now before congress a measure carrying a much larger appropriation than formerly, and we are going to try to see that some of that is extended along the lines of almond investigation.

Our greatest trouble in California is that the almond blooms too early. It is the first tree in our orchards and unfortunately it is frequently caught by frost. We have had some experimental work done to develop a tree that will bloom three or four weeks later. If we can do that, the almond industry will receive great benefits. The present outlook for the crop of 1919 is good throughout the entire state. The crop is fully up to average and in many sections it is the best crop that has been produced for some little time. Up to about ten years ago, the industry languished. There was practically no market for the almond in California. The grower was then depending on the commission merchant and the speculator to furnish the market. He furnished it, but the grower got but a very small percentage of the gross returns. Almond orchards had been planted in several of the large almond producing sections that are now recognized, but they were being torn out in very many portions of the state, because of the fact that the grower did not receive enough to make it profitable. Almonds in the East for the last thirty years have had a retail value of about 35 cents. In New York and Philadelphia a retail price of about 35 cents. The grower previous to 1910 received about 10 cents or 12 cents out of this 35 cents. That did not leave enough for him to continue in the business, and he went out of the business. He organized in 1910 and since that time the relative returns to him have been increasing annually, while the cost to the consumer has not been increased, save last year when war conditions boosted them as it boosted everything else. But previous to last year the retail price in the East has been the same that it was formerly. It is to our interest as growers to see that the retail price is kept as low as possible, but it is to our interest also to see that we reduce the expense of distribution to the lowest possible point, and following this line the California Almond Growers' Exchange has succeeded in reducing the cost of distribution, in eliminating speculation, to such an extent that it

has actually raised the price of almonds to the growers practically $200 a ton. This has been saved by co-operation, and this is only one of the many benefits which we in the association have received from the organization of our exchange. This exchange was organized in 1910 with nine associations and 320 growers. It has increased until today we have 22 associations and 2,500 growers, and we are marketing probably 75 per cent, or possibly a little more than that, of the crop grown in California.

Now, with all these benefits which accrue to the grower from organization, we ought to have a 100 per cent organization, but we have not. There are some on the outside yet. We hope to get them. We are increasing each year. Last year was our banner year. We took in more members last year than we had taken in any one year before, but there are some out yet, but they perhaps will remain out, some of them, for a considerable length of time. It is difficult to see just why they are on the outside. Every man in the business should be a member, helping to boost for the common interests of all. But these men on the outside are being benefited alike with those who are on the inside of the exchange. But those who sustain it, pay for this benefit, and as it has been shown, it is a good investment. The grower outside of the organization is benefited and he realizes it, but rather than be a positive force and help in creating better conditions, he gathers up and fattens on the crumbs that fall from the association table. He is a commercial parasite.

It is the same old feeling, a desire to get something for nothing. He avails himself of what his neighbor creates and passes by. Some delude themselves into the belief that in selling on the outside and thus putting their output in competition with that of their neighbors they are exhibiting evidence of great business sagacity. As a matter of fact the business sagacity exhibited by him is about on a par with the fellow who attempted to lift himself over the fence by pulling at his bootstraps. There is as much justification in it and as much likelihood of the man doing what he ought to do in the community in which he lives. You can not build up this industry and make a success of it without you have the co-operation of the growers, and the larger the percentage of growers you have in the organization the greater success you will secure.

There have been at least two occasions on which the organization of almond growers in its practical condition has practically saved the almond industry of this state. One of them came last year when the rains in September, averaging about four inches in many of the almond growing sections of the state, damaged a very considerable portion of the almonds. All the later varieties that were on the tree in September when that rain occurred were damaged and they were in such a condition that they were not marketable, and had those almonds, averaging about 50 per cent of the entire crop, been thrown on the market at that time, utter demoralization would have taken place. It would have broken the market, and we would not only have been forced to sell those almonds last year far below the cost of production, but they still would have lingered in the market in that condition and would have been a menace to the present crop. Through organization and through the support given us in the exchange by the almond growers, we were enabled to handle that crop and put it finally on the market and sell it at first-class prices. For weeks it was a matter of utmost concern to the exchange to develop some

means of handling those almonds and getting them marketable. The market at that time was demoralized from the fact that the confectioner could not get the sugar necessary to manufacture the candies that are usually made with almonds. The supply was short and the confectioner did not want the almonds. Had we cracked them we would have had an oversupply, and we were handicapped in various directions, but we did succeed in securing a formula which enabled us to remove that rain stain damage and then put them on the market. We had for a long time a most trying experience. We had no formula. None had ever been thought out because this experience had never before come to the almond growers. Nothing like such a calamity had ever overtaken us, and yet with the co-operation of the growers, and they were very patient, at a time when it meant a difference between a loss and a profit, for the entire year—they were very patient. As the weeks went by and the demand on the other side came—"Why don't you send almonds to us?" we were working night and day to get them in a condition to send them, and finally we sent them, and our people have all been benefited by it.

I will tell you another thing that we have done. We have gone into the markets of the East and placed almonds where almonds were never sold before. We are looking forward to the time when the State of California is going to produce at least three or four times its present output of almonds. And we are preparing for that, not by selling in large quantities, but in getting as wide a distribution as possible. Seventy per cent of our almonds are sold today to those handlers who buy less than 50 boxes, 40 per cent to people who handle less than 25 boxes, and we are sending almonds to three-quarters of the states of the union, into Canada, and into many towns of less than 2,000 population. What is the object? The object is to create a demand for almonds such that when this large increase of almonds which we know is sure to come, comes, it will have purchasers in the East. That is one of the objects of the association. It is to prepare for the future, and it is one of the ideas that the outside seller loses sight of. The almonds sold on the outside come into competition with us. The man on the outside buys a particular lot of almonds that he can handle and he probably sells them at a profit. The California Almond Growers' Association takes every almond presented to it, and if it is of a merchantable character and quality, the grower is paid accordingly. If it is not, that almond is so cared for that it does not come into competition with the better grades of almonds. We are strong believers in co-operation. We believe it is the proper method of handling the almond. We know that in our own case, those of us who are in the business—before the organization—we know that we received less than 50 per cent of what we are receiving today, and we also know that our almonds sold at the same price in the East that they are selling today. This is one of the great reasons why we are urging co-operation in our particular industry, and we are advising, as we go about the state, our growers who are interested in other lines to take up the subject of co-operation in the several lines in which they are interested. We believe it is the only method by which we can continue in the business. We believe that co-operative selling administered along business lines is the proper course for the growers of California, and we in the almond business, while we

have today only about 75 per cent, we hope as we continue, in the course of education that we are continuing now, to get our growers up to the realization of the fact. We believe the time is yet coming when we will come very near to having a 100 per cent organization, and take care of any calamity that might befall our organization or our work.

Mr. Rixsford—Do you know the quality of Jordon almonds imported from Spain, and also what the prospect is of growing that variety here, which many think is the best variety grown anywhere?

Mr. Pierce—We are informed by a gentleman whom we have, that the cracking of the Jordan almond is done in Spain by hand. We can not compete with Spain. Labor in Spain can be had for about 70 cents a day. That, compared with our $4 a day, puts us out of the running. The Jordan almond can be grown here in California. It is not a very prolific bearer. We are now discussing the problem of cracking. We can not crack the Jordan almonds successfully with any machine we yet have. In Sacramento we have a large plant occupying a half a block, and there we have cracking machinery with which we crack the ordinary almond of commerce. We can not, however, crack the Jordan almond, because it is intended for high-class confectionery, and brings a high price provided it is not hurt in the cracking. If any one will invent a machine to crack the Jordan almond successfully—when that time comes—the raising of that almond in California will be profitable. But at the present time it is a hard-shell almond and has to sell at hard-shell almond prices.

THE ALMOND INDUSTRY.

By Geo. W. Pierce, Davis, California.

INTRODUCTION OF ALMOND.

Rapidly growing in importance among the many and varied soil crops of California stands the almond industry. Its introduction into the state, while not definitely established, probably dates back to the days of the Mission fathers. A native of Persia, and largely grown along the borders of the Mediterranean Sea, it found congenial soil and climate in California. Its growth as an industry was at first slow because of the exacting conditions demanded by the tree to make it productive. Chief among these are those of soil, climate and pollination. Each of these in turn have been made the subject of special investigation until today the intelligent orchardist no longer plants at random as was the practice as recently as twenty years ago. As a mere tree, the almond grows almost anywhere that any other orchard tree will grow, but if it is to be a financial success it must be planted with due consideration to the requirements of the tree.

CALIFORNIA FIRST IN ALMOND PRODUCTION.

California is the only state in the United States that produces almonds in commercial quantities. Texas and Arizona tried the experiment and scored a failure. Even in California, locality has much to do with the size, color and quality of the almond. Notwithstanding these many restrictions, almonds are grown in California from Riverside on the south to Tehama on the north. The conditions required for successful growth are most frequently found in the great central valleys of California. Taking Sacramento as a pivotal point and describing a circle with a radius of one hundred and fifty miles, the area within the circle thus drawn would include fully ninety per cent of all the almonds grown in the state.

The annual production of almonds in California has in recent years ranged from 3,000 to 5,000 tons. This is about one quarter of the amount consumed annually in the United States. The remainder is supplied by imports from Spain, France, Italy and other Mediterranean sections. That our competitors labor

under similar conditions to our own, is noted in the quality of the nuts shipped from various sections. Spain and adjacent islands ship to us the best of our imports, but with these California now competes on an even keel and our products are gaining in popular favor.

ALMOND PROBLEMS UNDER CONSIDERATION.

While the University of California has rendered much material service to local growers, there are still many unsolved problems connected with almond culture in this state. The federal government has been slow to recognize our importance, and while making annual appropriations for investigational work on other nut crops has not extended this work to the almond. Attention has been called to this oversight by our organization, and we hope to have in the near future the aid of federal investigators in the solution of certain cultural problems.

OUTLOOK FOR NINETEEN HUNDRED NINETEEN.

The present outlook for the crop of 1919 is good. Much new acreage comes into bearing this season and much new acreage will do likewise for some years to come. The industry took on new life and vigor with the forming of a co-operative selling organization in 1910. Since that time its growth has been steady and its importance as a permanent industry is now firmly established.

VARIED EXPERIENCES OF NINETEEN HUNDRED EIGHTEEN.

The season of 1918 was one of varied experiences, intense anxiety and final triumph for the almond growers of California. The unseasonable rains of September, 1918, averaging in the chief almond districts, between three and four inches, found about fifty per cent of the crop still on the trees. All of the nuts thus exposed were more or less damaged. In their rain damaged condition there was for them practically no market at a price that would cover the cost of production. The damaged nuts were not of varieties suitable for cracking. War conditions, restricting the use of sugar by confectioners, lessened the demand for almond meats. Positive loss, running into large figures, stared the almond grower squarely in the face. At that time there existed no known method of restoring those almonds to a merchantable condition. No formula for the work was in existence, for its need had never before been so pressing. No such universal disaster had ever before befallen the industry. Co-operative effort, however, saved the day.

CO-OPERATION SPELLS SUCCESS.

Fortunately for the business, the growers had for years been getting together in a co-operative association, organized under the nonprofit horticultural laws of California. This organization is known as The California Almond Growers Exchange. Its chief functions are the preparation for market and the marketing of the California almond output. This association of progressive growers, without a moment of hesitation undertook to prepare these damaged nuts for market. It entered an experimental field hitherto untrodden. It drew upon the knowledge of numerous expert chemists. It suffered many disappointments, but its ultimate reward was success. Loss was averted. The calling was rescued. The nuts were made marketable and were disposed of at full prices. Not the least among the achievements of the seasons' experiences is the fact that we are now prepared to care for any similar disaster should it ever again befall us.

All credit for this successful outcome is due to the loyal support given The Exchange by the growers. They had patience during the experimental work and watched the outcome with much anxiety. Its success or failure meant to them the difference between a profit and a loss on the season's operation. Their co-operation prevented the flooding of the market with a product that nobody wanted. It prevented the breaking of the market and the almost irrevocable loss of a valuable prestige we now enjoy.

What of the organization that averted a disaster and extracted a benefit from a disaster? The California Almond Growers' Exchange was organized in May, 1910, starting with nine associations and 230 members. To say that it fought for its existence for several years gives but little idea of the difficulties met by the growers in their struggle to obtain a fair proportion of the selling price of

their crops. Today the Exchange has twenty-two associations and 2500 members. It has no capital stock. Its members are not bound together for any definite length of time. They began to co-operate because they were compelled to do so or go out of the business. They stay together because they can not afford to do anything else. They find that with a selling organization, wholly their own and under their direct control, that their interests are better conserved than they ever were when they employed selling agents working on a commission and charging them all the traffic would bear. Together they have eliminated much loss in distribution and have cut out speculation to an extent that has increased the returns to the grower from 75 to 100 per cent, actually netting an increased revenue of about $200 per ton, without increasing the cost to the consumer in the slightest degree.

ASSOCIATION WAREHOUSES.

There are now 13 local warehouses belonging to as many associations. Besides these, there is a central plant at Sacramento which is the common property of all growers. These several plants have cost the growers around a quarter of a million dollars and they have been paid for at the same time that the returns to the grower have been increasing annually.

The Sacramento plant is one of especial pride and satisfaction, representing as it does, the combined effort of the progressive growers to protect and perpetuate their calling. The buildings of this plant represent 33,000 square feet of floor space. It is provided with the most approved machinery and equipment for handling, processing and shipping. Bins, holding 200 tons of nuts, conveyors and elevators to eliminate handling, an automatic bleacher of six tons per hour capacity, ample equipment for cracking sticktight almonds, a nut shelling system with an output of ten tons of shelled product daily, grading and sorting systems, a complete equipment for processing rain stained almonds together with a loading platform and shipping facilities to accommodate nine freight cars at a time, all brought together within four years at the Sacramento plant, are some of the evidences of actual results obtained from co-operative work among producers.

By far the greater part of the machinery and equipment in the plant has been designed for our especial use. We are pioneering and bending every effort to place the almond industry on a firm foundation. Already we see the necessity for enlarged quarters and have recently purchased additional real estate, making our holdings in Sacramento an entire half block. On this newly acquired property will be constructed buildings to meet the growing necessities of our business.

ORGANIZATION BENEFITS INDUSTRY.

With such a showing as this we should be a one hundred per cent growers organization. Every man in the business should be a member helping to boost for the common interest of all. Co-operation is benefitting the entire industry. Those who sustain it pay for this benefit, and as shown it is a good investment. The grower outside the organization is benefited and he too realizes it. Rather than be a positive force and help in creating better conditions he gathers up and fattens on the crumbs that fall from the membership table. He is a commercial parasite. It is the same old failing, a desire to get something for nothing. He avails himself of what his neighbor creates and *pays* for. Some delude themselves into the belief that selling on the outside and thus putting their output into competition with that of their neighbors is evidence of great business sagacity. Their wisdom is on a par with that of the fellow who tried to lift himself over the fence by pulling at the straps of his boot tops.

Co-operation among the almond growers of California has, on two occasions within the last two years saved the business from serious commercial difficulties. These threatened calamities were met at the threshold and crushed. As a knowledge of these achievements becomes more extensive among the growers, and when prejudice and selfishness give way to business principles in a workable degree, we hope to have a 100 per cent organization to face any emergency that may arise.

The Chairman—Another great co-operative association is the California Walnut Growers' Association. Much of the success and efficiency of that organization is due to the indomitable energy and good judgment

and ability of its general manager, Carlisle Thorpe, whom I am very glad to introduce to you.

Mr. Thorpe—MR. CHAIRMAN, LADIES AND GENTLEMEN:

I think Mr. Teague is "passing the buck" on this "Walnut Association" business. He is the president and original organizer of it.

The Chairman—That is what I call team work.

(*Mr. Thorpe reads as follows*):

PRODUCING AND MARKETING CALIFORNIA PRODUCTS.

By C. THORPE, Los Angeles, California.

There are two equally important factors in every horticultural enterprise—producing and marketing. The average horticulturist devotes over 98 per cent of his time to producing his crops, and less than 2 per cent to the marketing of them. Yet the selling end is fully as important as the producing end. Of what avail is an abundant yield of fine quality without a ready and profitable market? It costs the average fruit grower at least ten times as much to produce his crop as is charged by co-operative organizations to intelligently market it.

CO-OPERATIVE ASSOCIATION SERVES THE GROWER.

Most of the large California growers' co-operative associations were organized primarily for the purpose of reducing marketing costs in the distribution of the products they handle and obtaining a reasonable price for the producer without materially advancing the price to the consumer. All of these organizations, I think, in their early stages, to a varying degree, accomplished these results, and thus reduced the number of hands their product passed through in its journey from producer to consumer.

But the modern and highly efficient producers' co-operative association has developed a much broader field. Of course, the economical marketing of the merchandise handled is still an important feature of the organization but the larger growers' associations are now serving the grower, the trade, and the consumer in so many other ways that the mere accomplishment of economically marketing the growers' crops is but a portion of its functions.

CALIFORNIA FRUIT GROWERS SPECIALIZE.

The California fruit grower of today generally is, or at least should be, a specialist. He properly concentrates his full business efforts on producing larger and better crops. The field of knowledge in his profession is so varied and intricate, and is being added to so constantly that it takes practically all of his time to keep abreast of the latest developments in the most approved methods of producing the crops he is specializing on. The California grower who gives a great deal of study to the most improved methods for producing his crops is the successful grower.

Every successful grower must necessarily give a great deal of his time in assimilating and putting into practice these modern producing methods. Consequently he has little time to devote in becoming a marketing expert, little time to give to legislative matters affecting his industry such as tariff questions, freight rates, etc., and it is utterly impossible for the individual grower to obtain unbiased market information and impossible for him to definitely know of foreign competitive conditions where the crops he is growing are also produced abroad and imported to America in competition with the domestic product. Consequently it is impossible for him to individually market his crop to best advantage. The comparatively few growers remaining independent of their organizations usually turn the association's marketing information to their benefit, that is they get under the association's umbrella by selling their crops on a basis of the association prices and not on their own judgment. This recalls a statement that one of our successful country bankers made the other day when he said, "I would have about the same opinion of a man who continued to sell his walnuts on the outside that I would of a man who used my bank for his convenience in cashing checks, but who made all of his deposits in the bank across the street."

Every large growers' co-operative association should be, and generally is, in a position to gain and disseminate all such information to its members. It should and generally does exert its every effort in securing fair and equitable freight rates and reasonable tariff protection for its members and these growers' organizations are in a position to gain the best possible market information both domestic and foreign.

GROWTH OF THE PRESENT ASSOCIATION.

I have been asked today to speak particularly with regard to the California Walnut Growers Association. In 1914, when I became manager, our annual business totaled $1,800,000. We have since constantly expanded until our last season's sales totaled between $8,000,000 and $9,000,000, and we are expecting to do over $10,000,000 this year.

We market the output of twenty-five local walnut growers' associations located throughout the principal walnut producing districts of California. These local units receive, grade, and pack the output of their individual grower members under standardized regulations and specifications of the California Walnut Growers Association.

The California Walnut Growers Association has no capital stock. Its membership is voluntary and members have the privilege of withdrawing at the end of each season. A similar withdrawal provision is extended the individual growers of most of the local walnut associations. Consequently, we must give our growers satisfactory service and satisfactory returns in order to retain their membership, and I am pleased to say that our record since organization shows that we have gained in membership forty-two acres for every one acre lost.

Prior to the organization of the California Walnut Growers Association the local associations marketed their output through the large California commission houses, paying 6 per cent commission for their sales efforts only—no other service was given by them. These local associations have never been charged more than 3 per cent selling expense on the f. o. b. value of the product by the California Walnut Growers Association and this charge has sometimes been as low as 2½ per cent. Thus, the selling cost has been cut in half. This reduced cost has meant a saving on the 1918 crop alone of a quarter of a million dollars to Association members. But the big point is that when the California walnut growers sold through the commission houses there was hardly a season when the crop was sold out at the opening prices. Almost always a heavy carry-over resulted, with a subsequent material decline in price, which, of course, the grower had to stand. The California Walnut Growers Association, notwithstanding the fact that prices have constantly ruled higher since the Association was organized, has always moved its entire holdings at the opening prices and has often, as this year, obtained a material advance for a perceptible portion of the crop.

But while we call our 3 per cent charge to the grower a marketing cost, it includes much other necessary and expensive service that the grower never received through the commission men. We maintain salaried representatives in the principal walnut producing countries abroad from whom we receive cable and mail advices as to the extent of the foreign crops, their quality, and the general market conditions abroad. We maintain a selling organization of over 150 representatives in the principal distribution markets of America. These representatives have been carefully selected for their ability not only as salesmen, but also for their ability in furnishing accurate information on the general conditions of their market which affect the consumption of our goods. Thus, the Association is in touch at all times with both domestic and foreign market conditions, and the information it thereby gains is invaluable in determining the best prices at which its product can be readily placed into consumption.

As important as market conditions is an accurate estimate of both the foreign and domestic production. We must be able to accurately judge the supply as well as the demand. An individual grower can but guess at the extent of either the foreign or domestic crop, whereas the Association's predictions on both foreign and domestic crops have, each season, been more nearly accurate than any other published estimates either by independent packers or individual growers, and this information has a great deal of value in enabling the Association to place the proper price on its product, as only justified by accurate advance knowledge of supply and demand.

THE FIELD DEPARTMENT SERVICE.

A few years ago the Walnut Association developed a field department service which I may predict will be shortly followed by most of the large co-operative organizations in this state, for with us this department has proved of very great value. As our industries enlarge our cultural problems increase. Both the federal and state appropriations for handling the growers' problems are grossly inadequate. The Walnut Association has kept two experts in the field under the direction of Professor Batchelor of the Department of Agriculture of the University of California, and through this department and the co-operation of the University, we are solving the cultural problems of the walnut industry. The three worst pests we have are the walnut blight, the aphis, and the codling moth. Methods for eradication of the aphis have been perfected. The codling moth, it is believed, will be controlled within the next year or two through the joint efforts of our field department, the State Horticultural Commission, and Professor Ralph E. Smith of the University. Apparently there is no possible method of control for the blight, but we have brought out new varieties of walnuts that are practically blight resistant. Our field department works on soil management, fertilization, pruning, die-back, rootstock selection, bud selection, and all other cultural problems, and through the expenditure of less than ten thousand dollars annually, and through the co-operation of the University, we have already solved problems which will mean the saving of several hundreds of thousands of dollars annually to the California walnut industry. So I say that a similar field department will doubtless become one of the important features in every large growers co-operative association in the near future.

MARKETS DEVELOPED THROUGH ORGANIZATION.

The time was when overproduction meant a weak and declining market. Thanks absolutely to the California growers' organizations that time has passed. No unorganized industry can develop markets nor do anything to increase consumption. Only through the volume possible through organization can these things be accomplished. The California Walnut Growers Association has perhaps as wide a distribution of its product as any national sales organization in America. The greatest efforts are being made to develop an average per capita consumption throughout every section of America. Only through uniform consumption can the maximum demand be developed. To obtain and maintain uniform consumption requires a great deal of special sales work. An unorganized industry can not do this, and in most of our California horticultural industries we are right now facing a period of greatly increased production which apparently has no limit. For instance, the production of walnuts is doubling about every six years. If we sit by and do nothing to increase consumption overproduction will soon overtake us. Besides the special sales work which is a big factor in maintaining consumption, national advertising is a prime necessity. An unorganized industry can not advertise. Nor can an unorganized industry successfully attack unjust tariff legislation, discriminating freight rates, nor obtain helpful legislation.

The California Walnut Growers Association accomplishes all of these things, including its national advertising, special sales work where necessary, widens distribution, handles the national legislation, maintains its field department, has just organized a membership department to put on a campaign for increasing its membership, and markets its members' crops at satisfactory prices, and does all of these things at a cost to the grower of 3 per cent of the f. o. b. value of his product.

These accomplishments are only possible through the principles of growers' co-operative associations.

Mr. Thorpe—This morning I was invited to go to Hemet and look over a little field there which our field department has near Hemet. And if any of the growers could have been with me and seen the result of the year's experiment, they would say that the field department has paid for itself for the next ten years in this one year's demonstration. They have been troubled with die-back. Some people thought it was frost, and they figured everything but the fact that they did not give enough

winter irrigation. We put a little laboratory over there and got the co-operation of one of the growers and he agreed to operate this place along the lines our field department suggested, and that grove, which was one of the worst examples of die-back a year ago, is today as healthy a looking grove as there is there, after one year's experiment, and I believe we will have one of the very best producing groves in the Hemet section through the efforts of the field department. This condition is typical of that section, and if we prove through better cultural methods that we can check this die-back, the industry will develop much faster in that large section. The growers already have derived $50,000 a year.

Chairman Teague—Practically all that work is through the operation of the University of California?

Mr. Thorpe—Yes; we pay the salary and expenses of a couple of field men and they are directed by the university under an agreement with the university. The university has given us very fine co-operation. They did not have enough funds to do the work necessary and through this joint arrangement the matter has been handled very satisfactorily.

Mr. Sprague—What percentage do you market of the whole output?

Mr. Thorpe—Seventy-five per cent.

The Chairman—The relation of soil moisture and orchard irrigation practice will be explained by Dr. Samuel Fortier, Chief of the Irrigation Division of the United States Department of Agriculture at Berkeley.

(*Dr. Fortier reads paper as follows*):

RELATION OF SOIL MOISTURE TO ORCHARD IRRIGATION PRACTICE.

By SAMUEL FORTIER, Berkeley, California.

ORCHARD IRRIGATION DEFINED.

Orchard irrigation covers a broad scope. It may be said to begin with the precipitation which falls in the form of rain or snow and to end with the mature fruit on the tree. It embraces such main features as water supply, irrigation works, distributary systems, water delivery, application of water, water-holding capacity of soils, soil moisture and its distribution, beside a large number of closely related subjects.

Orchard irrigation is likewise the result of a combination of efforts on the part of men who differ widely in their training and experience as well as in their purposes and viewpoints. Many of the orchard districts of the far west were started by promoters. Then followed financiers, managers, engineers, and real estate agents. By the time farmers started to plant trees, conditions as regards organization, management, water deliveries, and the quantity of water allowed per acre were more or less definitely fixed. It often happened, too, that the work of one set of men was not properly correlated to that of another set, so that misfits were the rule rather than the exception. While the real purpose of orchard irrigation is to grow better and larger yields of fruit, promoters and others frequently side-tracked the real purpose in order to attain some specific object which promised greater personal returns.

NECESSITY FOR ADEQUATE WATER SUPPLY.

Before proceeding to a discussion of soil moisture, it might be well to refer briefly to the necessity of an adequate water supply in order to insure sufficient soil moisture not only to maintain orchard trees in a vigorous condition, but also to grow cover crops between the rows.

The history of the water supply for a typical orchard tract usually dates back to the time when a company, district, or other form of irrigation enterprise is

formed to provide water for a certain acreage of barren or low producing land.

The average amount of water which can be used per acre as determined when the project is first organized and built is likely to continue for long periods of time. Thus, when the Gage Canal, near this city, was built in 1887, the duty of water was fixed at one miner's inch for 5 acres, and for 31 years water deliveries have been based on this duty. At present the formation of a number of irrigation districts is under way in California, and in most of these, in determining the average amount of water which can be used on each acre of the newly organized enterprise, it is often necessary to curtail the use in order to make the undertaking appear to be feasible. This is especially true in localities where water is scarce and valuable. Assuming by way of an example that 30,000 acre-feet of water is available for a proposed project and that this supply is apportioned on the basis of 2½ acre-feet per acre per annum, it would only cover 12,000 acres and the construction cost might be prohibitive whereas if the basis of apportionment could be made 1¼ acre-feet per acre, an area of 24,000 acres would be served with the same amount of water and the construction cost might thus be kept within economical limits.

ACTIVITIES OF THE U. S. IRRIGATION SERVICE.

The State Engineer, as you know, has to pass on this and other features of new irrigation districts, and as our bureau is co-operating with the office of the State Engineer, members of our force are frequently called upon to investigate and report on such matters. Mr. C. E. Tait, our resident representative in southern California, has devoted considerable time during the past two years to proposed districts in southern California. A commission of three, consisting of the State Engineer, J. A. Sourwine, and C. E. Tait, has recently recommended in connection with the duty of water for Victor Valley on the Mojave River, that only those crops be grown on the greater part of the land which require a relatively small amount of water, in order that the water available may be made to serve the maximum area of land, and the acre cost of the works correspondingly reduced to the minimum in order to make the project financially feasible. In passing on this proposed district, the Commission found itself between "the Devil and the deep, blue sea." If it recommended an adequate water supply for all crops adapted to that locality, including alfalfa, the cost would be prohibitive and no districts could be formed. If it reduced the estimated seasonal amount of water which could be used, below a certain quantity, the crops were liable to suffer and so it adopted the only middle course possible by recommending the planting of such crops as apples and pears, which require a small amount of water.

In attempting to fix the duty of water for proposed irrigation districts in San Diego County, similar difficulties have arisen. Some of the promoters of these districts seem to think 8-10 of an acre-foot per acre, or what would be equivalent to 1 miner's inch flowing throughout the year for 14½ acres would be sufficient. Their hydraulic engineer cites cases where 1 miner's inch served 24 acres of orchard. In arriving at a decision where differences of opinion exist, it is necessary to consider the welfare of the grower of fruit as well as the vendor of land and water.

Water is to the orchard what blood is to the human body. Both are conveyors of food. So essential is water to the life and vigor of the fruit tree that an adequate supply should be guaranteed or procurable before a tree is planted. It is said that half a loaf is better than no bread, but this adage does not apply to a water supply for fruit trees. There is nothing gained in merely keeping trees alive. In order to be profitable, trees must have sufficient water and food, coupled with other favorable conditions, to resist disease and to produce a fair crop of marketable fruit.

IRRIGATION WITH RELATION TO COVER CROPS.

This brings up the question of cover crops. If cover crops are necessary, all new enterprises should be provided with water not only for the growth of the trees but also with some surplus to be used in growing leguminous crops for plant food.

I feel sure the State Engineer and his associates, as well as the members of the Irrigation Division would appreciate some expression of opinion from this

body as to the wisdom of providing sufficient water either from rainfall or irrigation to satisfy the requirements of fruit trees as well as cover crops.

It requires from 750 to 1200 pounds of water to produce one pound of air-dried alfalfa, and other leguminous crops will require nearly as much. Accordingly, in localities where the annual rainfall is low, sole dependence can not be placed on the winter rains to furnish moisture for cover crops. Part of the soil moisture must come from the irrigation supply, but as I have intimated, horticulturists, irrigation engineers and others are not in agreement as to the proper duty of water for orchards, largely because of the amount, if any, that should be allowed for crops grown between tree rows.

My experience in growing fruit is too limited to warrant an opinion on the subject of cover crops. I have had, however, a rather long and varied experience in growing other crops under irrigation, and this experience all points to the conclusion that arid soils to be productive need not only water but organic matter. A few concrete examples of experience gained in different western states may serve to make my position clear.

In the eighties, when I was Assistant Engineer of the Denver Water Company, I had occasion to do some work at Greeley, Colorado. For 12 or more years prior to that time the farmers of the old Greeley Colony had been growing grain under irrigation, year after year. In time this crop became unprofitable, due to small yields. Alfalfa was then introduced and at a later period sugar beets. As a result of rotation with alfalfa as a base, a wonderful change has been brought about, not only in the quality and quantities of the crops grown but also in the condition of the soil and the manner in which water can be distributed through it.

In the early nineties, when I was Director of the Montana Experiment Station, our practice was to sow red clover seed with the grain and to cut the clover the following season for hay. By this simple 2-year rotation of grain one year and clover the next, we produced very heavy yields. In one year wheat yielded as high as 78 bushels per acre and oats 120 bushels. These high yields would not have been possible without a large percentage of organic matter and an adequate and well maintained moisture content in the soil.

In establishing a sub-experiment station at Gooding, Idaho, we first grubbed out the sage brush. It is well known that arid soils are as a rule lacking in vegetable matter and to supply this deficiency we applied manure. The effect of this manure, coupled with rotation, enabled us to produce over 9 tons of cured hay per acre of both red clover and alfalfa in 3 cuttings.

In 1906, when I was preparing a report for the government on irrigation in the Sacramento Valley, I had occasion to look into the effect of long-continued cropping to wheat in this valley. The evidence that I collected at that time showed that the physical condition of the soil had undergone a change for the worse. It had become more inert and sticky and required more mules to run a gang plow. At that time, too, wheat raising in the Sacramento Valley was not a profitable industry on account of the low yields. That was some 12 years ago and since then there has been an enormous development along the lines of irrigated agriculture. Many of these old wheat fields, which produced 10 to 12 bushels per acre have been in alfalfa for years and when the alfalfa stubble is plowed under, the soil is found in excellent condition for subsequent crops.

These brief references simply confirm what you already know as to the value of organic matter in irrigated soils. I sometimes think it unfortunate that we can not pull up the citrus trees of California as one would fence posts, grow alfalfa on the tracts for three years, then turn under the alfalfa stubble and return the trees to their original places. If this were possible, you would find, I believe, that any common method of irrigation would suffice to produce excellent yields of fruit. The nearest approach to the application of this remedy is to grow leguminous crops between the rows or use manure. The time is approaching when manure in sufficient quantities will not be available and recourse must be had to cover crops. In such cases it is imperative that sufficient water be furnished either from the clouds or the irrigation canal, not only for the requirements of the trees but also to grow the legumes necessary to maintain the fertility as well as the proper physical condition of the soil.

EFFECTIVE WATER-HOLDING CAPACITIES OF SOILS.

If a 40-gallon barrel is filled with soil approaching the condition in which it exists in an orchard, it is possible to add from 7 to 15 gallons of water, depending on the character and texture of the soil, before any runs over. This, however, is not the way soils are irrigated. To approach conditions as they are found on an irrigated tract, it is necessary to punch holes through the bottom of the barrel and allow the water to drain out. The water which drains out is called free water and what remains capillary water. This is the reason I have called this topic the *effective* water-holding capacity of soils; since in all ordinary cases the free water either drains off or becomes capillary water. In filling reservoirs, tanks and other vessels with water, the capacity of each is known and there is no occasion to waste water in overflows. It is different in the case of soils for the reason that it is not generally known how much water soils will hold against gravity within the root zone of plants. This knowledge would be easily gained if all soils and subsoils were alike in character and if the roots of fruit trees and other plants were always found at the same depth below the surface. Soils and subsoils differ very widely in texture and character. While sand, silt and clay are the chief ingredients in all soils, the relative proportions in which these occur may be said to be infinite. It is, however, possible to group these into a small number of divisions. For the purpose of this paper, we may call these sand, sandy loam, fine sandy loam, gravelly loam, silt loam, loam, clay loam and clay. In addition to the mineral matter, there is in soils a small amount of decomposed vegetable matter called humus which averages less than 1 per cent in arid soils besides great varieties and infinite numbers of micro-organisms chiefly bacteria. In certain localities, the surface soil is underlaid at varying depths by a more or less impervious sub-stratum called hardpan. Hilgard's definition of this is a dense and more or less hardened layer in the subsoil which obstructs the penetration of both roots and water. This, in brief, is the situation which confronts the irrigator in regard to soils. Some are so porous that when water is applied to the surface it soon percolates far beyond the deepest roots and leaves little in the upper six feet of soil. Other soils are so dense that little, if any, water will pass through them and the moisture held in the top layer is soon evaporated. As regards the more porous types of soils, it would seem important to determine how much water can be stored in the upper four to six feet in order to prevent undue waste of water by deep percolation.

In the work done by Messrs. Adams, Robertson and Beckett in the Sacramento Valley and reported in Bulletin No. 3 of the State Engineering Department, the average quantities of water retained per acre-foot of soil at each irrigation were 0.82 acre-inch for the silt loams, 0.58 acre-inch for the clay loams, and 0.37 acre-inch for the clays.

MOVEMENT OF SOIL MOISTURE.

It is the force called gravity which draws the melted snows from the high Sierras and deposits the water in the ocean and it is this same force which draws the irrigation water downward through soils and subsoils. Until recently it was believed that the action of gravity in the movement of soil moisture was confined to the free water in the soil and that it produced little effect on capillary water. During the past two years McLaughlin of our Bureau has demonstrated that gravity acts on capillary moisture as well as on free water.

By placing soils of different types in wooden boxes lined with galvanized iron and having one side of glass, he has been able to observe the movement of moisture. These boxes were ten inches wide and ten inches high inside and of varying length. In some the capillary water could only rise vertically upward while in another set it could only descend vertically downward. Others were placed in horizontal positions and other boxes were placed at different angles, both upward to downward. To cite the results of but one experiment, it showed that after a period of thirty days the capillary moisture of the flume, which was placed vertically upward, had moved a distance of 32 inches, while that in the flume which was placed vertically downward had moved a distance of 181 inches, and the distances traversed by the flumes placed at various angles ranged between these two extremes.

Mr. McLaughlin also found that the force which is variously termed capillarity, capillary attraction, and surface tension, has been overrated. From statements which have appeared in textbooks and elsewhere, the impression has been created

that if moist soil comes in contact with dry soil, the moisture content in each will soon be about the same, due to the movement of water from the wet to the dry. Mr. McLaughlin found that when the wetter soil was placed in the soil boxes directly above the drier soil, that, largely through the action of gravity, there was considerable movement downward, but that when the positions of the two soils were reversed and the dry soil placed above, there was little movement upward. In the case of the Riverside soil, for example, containing 15 per cent moisture, the movement of moisture downward from the moist soil into dry soil was 7¾ inches in seven days, while upward it was only 3 inches in the same time. It was formerly held, as you know, that much of the water stored in the subsoil could be raised by capillarity to the level of the root zone and thus be utilized by plants. The results obtained by McLaughlin and others seem to establish the belief that only relatively small amounts of water can be raised from a moist to a less moist soil; also that the bulk of such moisture can only be utilized by the extension of the root system to where moist soil is to be found. I make these brief references to the action of the force of capillarity in order that those who irrigate orchards may not place too much dependence on having moisture drawn up to the root zone of trees. Unless the soil is very tight, or unless a layer of hardpan intervenes, there is little difficulty is having water move downward in all ordinary soils, but apart from the top layer of soil there appears to be little movement of water from the subsoils upward.

The movement of water in soils sideways from furrows depends on the nature of the soil, the amount of organic matter which it contains and other factors. In ordinary soils a sidewise movement of two feet is about as much as can be expected, whereas in tight soils containing little organic matter and in poor physical condition it may not exceed nine inches in several days. Sometimes the water in its downward course encounters an impervious layer, becomes somewhat dammed up and then spreads laterally. Under such conditions the horizontal spread of water may be considerable.

In considering soil moisture and its distribution through soils and subsoils, some reference should be made to evaporation and the loss of water which it entails. A dozen years or so ago I carried on some experiments in California to determine this loss. These investigations showed that the loss of water by evaporation from irrigated soils particularly when the entire surface is moistened, is very great for the first two days or so after water is applied. This is simply another factor which is involved in the many-sided subject of orchard irrigation.

In summing up the situation in regard to soil moisture, there appears to me to be at least two essentials that deserve careful consideration. One of these is the amount of water which a soil of a given type will retain against gravity at each irrigation within the root zone of the trees and the other is the smallest amount of moisture which a soil of a given type must contain in order to prevent damage to trees and their fruit.

We hear much these days about the optimum moisture content of soils, meaning by that the amount of moisture which is best for the plants. But this and other terms which I might name belong to the realm of theory rather than practice. It is not practical to maintain an even moisture content in the soil within the root zone of plants. The best irrigation practice merely enables the orchardist to fill up the soil with water without undue waste either by evaporation or deep percolation and to time the intervals between irrigations in such a way that the trees will not suffer for lack of moisture. This in turn brings up the question of how and when to apply water in order to attain these desired results. The California orchardist has little choice of methods. In the large majority of cases he must choose between furrow irrigation and some form of the basin method. I shall accordingly conclude this rambling paper by a brief discussion of some of the advantages and disadvantages of these two methods of applying water.

BASIN AND FURROW METHODS COMPARED.

The furrow method of irrigation may be regarded as modern, while the basin method is ancient. The orchards that were planted in Northern Africa by the Berbers prior to and during the Roman period seem to have been irrigated in basins. The records show, too, that it was customary in very early times to place straw manure, bean straw, and even grass on the basins and to soak this mulch with the water used in irrigation. For years the basin method was quite generally practiced in California and at present it is not far from the truth to

state that one-half of the irrigated orchards located north of Tehachapi are irrigated by some form of this method.

In southern California, for a quarter of a century or more, the large majority of orchard tracts have been irrigated by furrows. Besides, the irrigation systems, water deliveries, distributary systems, subdivision of orchard tracts and even the manner of setting out trees have all been designed and constructed on the basis of furrow irrigation. Basin irrigation would accordingly be a misfit in many of the irrigation systems of southern California and unless it can be clearly demonstrated that this form of applying water is superior to that of furrow irrigation, it would not be advisable to make the change. Reference has already been made to the value of cover crops and manures in order to increase the fertility and improve the physical condition of orchard soils. If a much larger percentage of humus was added to the soil and the hardpan and plow-sole broken up in such a way as to allow the downward passage of water and the extension of the root systems to a larger feeding ground, it may be taken for granted, it is believed, that the most serious of the irrigation troubles would disappear.

In setting forth some of the good and bad features of these two methods of irrigation and in comparing their relative merits, perhaps the strongest argument in favor of the retention of furrow irrigation is that it is admirably adapted to the irrigation systems of the South.

A small head can be conveniently and advantageously used in furrow irrigation and it is also more economical of water than any form of flooding, because the water surface exposed to evaporation is confined to a small fraction of the total land surface and a fairly large percentage of the surface soil is kept dry, thus preventing loss of water by evaporation. It likewise tends toward deep rooting and the prevention of root growth within the soil mulch covering. Furrows may also be used on a wide range of slopes from the flattest to the steepest and is about the only method which can be used on steep contoured sidehills. Furthermore, it calls for little grading or displacement of surface soil and no special equipment other than a furrower. For these reasons it is cheaper and more convenient than the basin method. Taking the state as a whole, the average annual cost of applying water by this method would be at least 30 per cent cheaper than by the basin method.

The chief objections to this form of irrigation are that the water is not distributed evenly over the soil within the root zone and that the fertilizers in the soil are not always conveyed by the water to the rootlets in the most efficient manner possible. It is believed that much can be done to remedy uneven distribution by using shorter runs and adopting a better location and spacing of furrows. Instead of allowing water to run in furrows for 600 feet or more in porous soils, the length of runs should be reduced by one-half. Efforts should also be made to moisten the entire area in which roots can derive water and food.

The basin method of irrigation is best adapted to relatively flat slopes, large heads and a fairly liberal use of water. The winter irrigation of orchards can usually be carried out by this method more advantageously than by any other, since at such times water is usually plentiful, the work involved in forming basins can be done at a time when other orchard work is not pressing, and large quantities of water can be applied in a brief time. The basin method possesses another advantage in that it provides a miniature reservoir in which nitrogenous matter may be deposited and soaked in irrigation water, thus affording a speedy and direct means of adding nitrogen and other plant food to the soil within the root zone.

Some of the disadvantages of the unmulched basin as compared with furrows are its greater cost, the larger loss due to evaporation, the shifting of top soil for dikes and ditches, the baking of the surface soil and in being limited in its application to relatively flat land. Perhaps the most serious objection to the mulched basin is that it introduces a radical change in the process of root development. The ordinary practice hitherto has been toward deep rooting and the prevention of root growth in the soil mulch. It is well known that the top nine inches or more of bare orchard soils in southern California contains little available moisture in midsummer. This top layer of dry soil merely serves as a covering to conserve the moisture and protect the roots beneath. Those who favor the mulched basin propose to modify this process by enlarging the feeding ground of roots. This is effected by luring them into the upper layer of soil by maintaining conditions favorable to root growth. These are moisture, plant food, and protection from

excessive heat and evaporation. It is not surprising to learn that fruit trees have responded readily to this good treatment. However, in order to make these beneficial effects permanent it will be necessary to keep the basins well covered with mulch continuously during the hot summer period. The removal of the mulch for even a short period in midsummer would be likely to result in the drying out of the moisture in the top soil, the destruction of the roots therein, and a setback to the tree itself.

Before attempting any changes on a large scale from furrow irrigation to mulched basins, it might be advisable to find out if the present practice in furrow irrigation could not be modified so as to secure many of the benefits of the mulched basin and at the same time retain the present furrow method of distributing and applying water. It has been suggested by Professor Veihmeyer that if an orchard tract which is irrigated by furrows could receive during the summer season one good flood irrigation in basins, it might prove beneficial. Manure or leguminous mulches could also be applied to the basins before water was turned on and by means of this double remedy the entire area of the orchard would be moistened and an additional food supply made accessible to the roots.

SUMMARY.

Summing up the relationship between soil moisture and orchard irrigation practice, the following points seem worthy of special consideration:

1. The great need of arid soils in general and of orchard soils in particular is an abundant water supply and a larger percentage of organic matter.
2. The effective water-holding capacities of soils should be determined in order to find out how much water to apply at each irrigation and how often to irrigate.
3. Comparatively little moisture is drawn upwards through soils by capillarity. It is only where a water-table is found within a few feet of the surface or where a body of free water comes in contact with the soil that this force is efficient in moving soil moisture.
4. Gravity acts on capillary water as well as free water and draws both downward unless a layer of hardpan or other impervious material intervenes.
5. The expense of substituting the basin method for the furrow method may be saved, providing the texture of the soil is improved by the addition of sufficient organic matter.

The Chairman—The next paper on the program was to have been one on "Oranges for Thanksgiving," by B. B. Meek, of Oroville. I understand Mr. Meek is not present. There was to be a discussion by Mr. W. L. Crowe, of Porterville.

Mr. Crowe—My understanding, Mr. Chairman, was that I was to discuss the paper that was to be read.

The Chairman—We have a paper. I thought it was getting so late and that we possibly could insert it into the record, but if you will be seated a moment, we will read the paper.

(*The Secretary thereupon read the paper presented by Mr. B. B. Meek of Oroville, entitled "Oranges for Thanksgiving" as follows*):

ORANGES FOR THANKSGIVING.

By B. B. MEEK, Oroville, California.

WHERE FRUIT GROWING DISREGARDS LATITUDE.

California was probably never characterized in a better or more striking way than by Professor Wickson some years ago when he wrote:

"Latitude which is a prime factor in geography is of exceedingly small account as an indication of horticultural adaptations in California. The fact becomes apparent when it is known that the apple and the orange, fruit kings, whose kingdoms lie at opposite borders of the Temperate Zone, so

far distant that one may be called semifrigid and the other semitropical, have in California utter disregard for the parallels of latitude which set metes and bounds upon them in other lands. Impressive as this truth may be, it is not so startling as another fact, viz, that fruits, in suitable interior situations, ripen earlier at the north than at the south, a complete reversal of the tenets of the geographer."

Undoubtedly the godly Philadelphian would be very much surprised if while peeling a delicious orange at a bountiful Thanksgiving dinner he should be informed that the orange was grown in the same latitude as Philadelphia.

And yet so completely have the usual influences of latitude been set aside in California that the growing of oranges in the Oroville district for the Thanksgiving trade is an annual occurrence and is accepted here as a matter of course.

I judge that the fruit growers of California are particularly interested in the commercial aspects of "Oranges for Thanksgiving."

Accordingly I shall discuss very briefly the development of the orange industry in the "Thanksgiving Orange" district, its present problems and what it apparently offers for the future.

Again let me quote Professor Wickson:

"One who seeks to know California well must undertake to master both its horticultural greatness and littleness; and so closely are these associated, and so narrow the belts of special adaptations, that there are counties which have a range of products nearly as great as the state itself.

It is hard for the stranger to realize this. It is difficult for him to believe that the terms "northern" and "southern" have almost no horticultural significance in themselves, that northern fruits reach perfection, under proper conditions, at the south, and vice versa."

Professor Wickson undoubtedly had Butte County in mind when he penned the above statement which we of northern California know to be literally and absolutely true. And because "northern" and "southern" have no particular horticultural significance in California, it is a perfectly natural although seemingly strange fact that the first ripe oranges of the season are shipped from the "northern" rather than from the "southern" portion of the State.

Let me emhasize that this is a natural result of natural conditions. Quoting Professor Wickson again:

"First, California is not only blessed with benign ocean influences, but northern California is additionally protected from low winter temperatures by the mountain barrier of the Sierra Nevada, extending southward from the multiplied masses of protecting elevation in the Shasta region, while southern California enjoys the protection of the Sierra Madre and other uplifts on the north and east of her citrus region.

Northern blizzards are, therefore, held back from entrance to California and are forced to confine themselves to southerly and easterly directions over the interior parts of the Pacific Slope, while the great blizzards of the northwest traverse the Mississippi Valley and if they have sufficient impetus, extend to the Gulf and carry destruction to semitropical growths even in northern Florida. The ocean then bringing warmth and the high mountains defending against cold, combine their influence to give nearly the whole length of California semi-tropical winter temperatures.

Second, although this striking similarity does exist, in citrus districts north and south, there is another even more startling proposition involved, and that is the influence exerted by the presence of the coast range as the western boundary of the great interior valley of the state, and intervening between that great valley and the ocean. The several ridges of the coast range with their enclosed small valleys serve as a colossal windbreak against northwest winds, which might otherwise, now and again, bring a temperature too low for citrus fruits, where now they are safe from injury. The chief effect of these mountains is to protect the northern interior valleys and foothills from the raw winds of early springtime, and to allow the sun as he crosses each day higher in his course, to expend the increasing heat directly in promoting vernal verdure. The result is a protected interior region in central and

northern California, of quick growth in all lines—early pasturage, early grain harvest and early fruit ripening.

It is due to this same early start which the local topography gives to the orange, followed by the high summer heat which is essential to the development of a good orange, that the orange reaches an acceptable commercial condition at an earlier date in suitable interior places at the north and is at present being almost wholly shipped to eastern markets before free movement begins at the south.

Third, still another feature of local topography must be mentioned as influencing citrus conditions north and south and explaining why winter temperature has fallen no lower at the north than at the south.

At the north the snow fields of the high mountains are farther from the valleys and mesas, where citrus fruits are grown, than they are at the south. The benches and low foothills of the Sacramento Valley, for instance, are forty to fifty miles from the high range to the east of them, and there intervene countless ridges of high foothills and small valleys, and before the citrus plantations can be reached by the descending air currents they are considerably warmed by rustling over so much land which has been warmed by the winter sunshine."

THE ORANGE IN BUTTE COUNTY.

I will only touch upon the historical development of the orange industry in Butte County. Suffice to say that when hydraulic mining was stopped, the old mining ditches were used for irrigation purposes. Oranges were planted, and all the mistakes that generally mark early plantings were made, with a few additional thrown in for good measure. Gradually, however, the planting increased and greater care was exercised until now there are about two thousand acres of navel oranges in bearing, and about six hundred cars of oranges are shipped from this district during a normal year. As indicating the early ripening quality of the fruit grown in this district, it may be of interest to you to know that fully 80 per cent of the oranges are shipped under tree color without sweating and our packing houses close down for the season the first week in December.

Of greater interest to this body than the history of the orange industry of the north is its present problems and its future outlook.

I am informed upon responsible authority that the highest average prices paid for navel oranges during the past ten years were paid to Oroville growers. This, of course, follows as the Oroville fruit is first upon the Eastern markets and arrives there in time for the holiday trade. There remains then only the necessity for producing more oranges to the acre. This is what we are endeavoring to do.

"JUNE DROP" AND COVER CROPS.

The big problem of the north is the control of the June drop. The heat units that put early color into the fruit and make it available for the holiday trade also are responsible for a heavy drop of oranges during the early stages of their development each year. The infant mortality of our fruit is excessive. In my opinion, this is the biggest limiting factor of our production and it can be overcome.

Experiments in summer cover crops, which serve to shave off the peak of a heat wave, and in the proper application of fertilizer have absolutely demonstrated that the June drop can be controlled. Within the past year the Butte County Farm Bureau has made the control of the June drop one of its chief projects and it can be conservatively said that this serious problem is in a fair way to be mastered if not actually mastered at this time.

And now briefly let me speak of the future of the industry as it appeals to me. I am neither a prophet nor the son of a prophet and accordingly you must judge for yourself the soundness of such predictions as may be herein ventured.

Assuming as a premise that the excessive June drop will be eliminated, there will be enormous expansion of the orange industry in the northern district. The northern district will become the premier navel orange producing section of the state.

My reasons are these:

(1) Our oranges ripen and are harvested before the frost comes. No orchard heating is necessary.

(2) The fruit reaches the Eastern markets in time for the holiday trade. Hence the highest prices are assured.

(3) The district is comparatively free from pests. There are no expensive fumigation or spraying costs to be met.

(4) Transportation facilities are abundant. This district is served by three railroad systems, the Southern Pacific, the Western Pacific and the Sacramento Northern. It has direct access to the East by fast freight over the Western Pacific Railroad.

(5) Land is cheap and water plentiful. Raw land perfectly adapted to the culture of the orange may be obtained from $25.00 to $50.00 per acre without water (to this must sometimes be added the cost of clearing) and water can be obtained at from $25.00 to $50.00 per acre. The annual cost of water is low compared with other districts in the state.

Thus the initial investment compared with that required in other parts of the state is exceedingly small.

Finally I would say that the proof of the pudding is in the eating. Or, if I may be allowed to mix metaphors if there are any doubting Thomases among you, come and see for yourself. To put it more colloquially, if there are any among you who are "from Missouri," come to Oroville this Fall and we will show you the land of the "Thanksgiving Orange."

Mr. Crowe—MR. CHAIRMAN, LADIES AND GENTLEMEN:

I don't mind telling you on the start that I am from Missouri, but for the past ten years I have had the privilege of living in Tulare County. This paper reminds me of old times. There was a time quite a number of years ago in Tulare County when we talked a great deal of oranges for Thanksgiving—navel oranges for Thanksgiving. In fact some of us and our older heads had Tulare the home of the early orange, and we shipped a great deal of fruit to the market for Thanksgiving. In 1912, I think it was, we shipped a few cars too many, and the government seized them and after a trial in the district court in the state of Illinois, the fruit was confiscated. This got us to thinking that perhaps those oranges, while they looked very good, might not be fit to eat. We knew that we wouldn't eat them, but we had to acknowledge to ourselves that the fellow back East thought they were all right. And coming back to this paper, he spoke of the high prices. These oranges that we shipped for Thanksgiving markets always brought the highest prices. A few years later, after this action of the government, we realized that some of us had almost lost our orchards. We realized that the oranges shipped for Thanksgiving were at the sacrifice of the balance of our crop. To be exact, in 1913, we started shipping about the first of November. If you gentlemen from Riverside will especially remember, the fall of 1913 followed the big frost. There were no Valencias on the market. It was before the big war and financial conditions of the country were good, and we looked forward to a great big price for our fruit, and we started shipping about the first of November, and one of our shipping concerns from the Porterville section shipped the first three cars. These cars arrived on the market about the twelfth of November. The price realized was $3.85 for two cars and $4 for the third car that was delivered. They put it in our local papers, and of course we growers swelled up and felt fine; we were going to get rich that year. But

before the first of December we were selling fruit in the New York market on the basis of red ink. Why was it? This fruit that went out for the Thanksgiving market was not fit for consumption, and we knew it. We thought we were slipping something over, but we did not do it. We could not pull it off, and the result was that these first few cars did bring us a fat price, but it was at the expense of the balance of our crop. But we did not realize it then. We still thought we could get by another season. But, due very largely to the efforts of Mr. E. R. Chase, we organized a protective association in 1914, to protect ourselves against ourselves. We organized this about the first of November, and, if you gentlemen will recall, it was the fall after the big war had broken out, and there was a tremendous crop of Valencias in southern California. Financial conditions of the country were not good. We had about 98 per cent of the fruit in our organization. We shipped it out—the 8 to 1 standard. Ninety-eight per cent of the navel oranges from Tulare County in 1914, were shipped out under the 8 to 1 standard. We moved the largest crop of fruit that we ever moved from Tulare County before or since, and there was not one car that netted the grower red ink, and we moved this fruit under difficult conditions—under poor market conditions. There were over 2,000 cars of Valencias to ship from southern California when we began shipping our fruit, all due to the fact that our oranges were fit to eat when we commenced picking. I think the big problem confronting the orange grower of today is consumption. We look forward in the near future to the shipment of eighteen to twenty million boxes of oranges annually from California. Hence, I think it is necessary for every orange grower, and decidedly important, to work for consumption. I happened to have the privilege of tracing one car of green fruit from Tulare County. It was sold in the state of Iowa for $3.85, and in getting the data of the experience of this purchaser, he informed us that he had made a resale to the retail trade at a profit. But, he said, it had cost him the sale of ten cars of oranges, while he had made a profit on that individual car. We realized later in Tulare County that if one car would cost the sale of ten cars, one hundred cars would cost the sale of a thousand cars. I don't think Butte County ever had 6,000 cars.

The Secretary—It reads 600.

Mr. Crowe—I don't believe they had that many. We are just as good and perhaps no better than they. We stopped shipping that way because we realized that it was ruining us. If we only had two hundred or three hundred cars, we would still be doing it, if the government had not stopped it. But, I understand, you gentlemen are all anxious to go, and I would like to say one word with regard to legislation. Some of us went to Sacramento last winter, and asked that our 8 to 1 standard be made a little more rigid. In other words, we asked for the color in addition to the standard, but in order to get this, it was necessary for us to make a concession for the people from the north, to let them lower the color standard.

There are three ways of prematurely coloring the orange, and in Tulare County, we can tell you all about all of them because we have tried them. The old-fashioned way is to color them on the tree. We did it and had it right down to a science. We just let the tree get a

little dry, and we knew just how dry to let it get, and we could force the color in from two to three weeks, but it did not change the eating quality of the fruit. That orange can be shipped today without violating the federal law, but it is not in conformity with the federal law. It is merely an evasion. The only law by which the federal government can reach us is under the Pure Food and Drugs Act. This is reached by reason of the deception of changing the color and making an inferior article look like an article fit for food. If we can force this color on the tree, we can get by. Then our friends in Butte County got the legislature to give us a color standard, and the law read, "Substantially colored on the trees before picking." It did not make any difference how unfit for food it was, if it was substantially colored. In Tulare we know how to substantially color. They changed that in order to allow us to make our standard more severe. We had to consent to their interpreting that to mean 70 per cent colored. Now we have a double standard in California, and that is 8 to 1, plus 25 per cent colored, or substantially colored on the trees, which is interpreted to mean 70 per cent colored. But the federal government has one standard and that is 8 to 1, and that is the standard which has saved the industry of California. It has absolutely saved Tulare County from ruin. We have over 40,000 acres of citrus fruits in Tulare and we are still planting some, and there are a great many acres in Fresno County and quite a few in Kern County, and I know you gentlemen have a lot more. So I think the edibility of the oranges should be the test as to the time of shipment, and what I have said with reference to Tulare County and our experience, I am sure applies to Butte County as well. I thank you.

The Chairman—I am sorry the gentleman from Oroville is not here.

Mr. Sprague—I would like to ask at what time Tulare County marketed its oranges in 1914?

Mr. Crowe—We commenced picking about the twentieth of November, and I might add that last year the navel oranges shipped all over the state were abnormally sweet, and they were naturally earlier. There is no particular time that we can set, but our standard will tell us each year the proper time to commence picking.

The Chairman—Do you desire to discuss any of these questions?

Mr. F. W. Waite of Imperial—The subject of cover crops in an orchard in regard to the June drop, I believe is a solution. We made an experiment in Imperial Valley in an apricot orchard, of having an alfalfa field planted in the orchard. During the hot wave the apricot crop was ruined excepting in this particular orchard, which was a normal crop, which would indicate to me that a cover crop in the summer time is a good thing. I would like to ask a question in regard to the proportion of moisture in irrigation, if it would not be a good thing to subsoil in an orchard to hold the moisture and also induce the roots of the plant to go deep.

Dr. Fortier—I am not sure that I can throw any light on that subject, as there would be the question of destruction of roots to consider. When I was looking into orchard matters in this part of California some fifteen years ago, they practiced quite deep plowing. Some went down as far as nine inches, and that is about as far as one can go economically. I

don't know of any case that has been successfully carried out along that line.

The Chairman—Can any one answer the question?

Mr. McPhee—I don't know that I can answer that question. To say positively that this deep plowing would solve the problem—but I am perfectly satisfied that it would. In Tulare County, in the irrigation of our vineyards, we subsoil. We subsoil in the middle of the row and I know we make the water go twice as far in that way as if we put it on ordinarily. If you apply water to the land that is at all hard, and watch it after the water is removed, you will find that it has penetrated to a comparatively slight depth, and, in order to get the water down to where it belongs, you have got to give it an opportunity to go there. I don't know whether it is the plow or the natural reach of the irrigation water year after year, but I do know at the depth of a foot or a foot and a half there is a hard, impervious soil that the water will not go through without help. Subsoiling will enable you to go through there. It is not necessary to subsoil every row, but out in the middle of the row where the roots do not reach, put your subsoil in as deep as you have power to put it and break up that hardpan and give the water a chance to soak underneath, and you will accomplish your object and grow your crops with less than half as much water than you will use if you do not follow a plan of that kind. We have found in Tulare County in some instances that our orchards and our vineyards were going back; there would be a yellowness in the leaf which indicated a wrong condition, and I remember particularly at one time finding that condition in our plum orchards and I called the superintendent's attention to it and asked for the cause, and he didn't know. There was no reason to be seen above ground and I looked below ground, and I asked him to have a man go out the next day and dig a hole in the center of that square, which he did. We found that the top foot of soil was well saturated with a bountiful supply of water. The second had a less, the third had very little, and at the end of thirty inches we found a stratum of dry dirt three feet in thickness. When we got through that we found moisture again. The irrigation on that ground had been as thorough as we knew how to make it but there had been no test made to determine whether the ground was soaked or not. The consequence was, if the matter had not been discovered as it was, we would have undoubtedly lost our orchard. Subsoiling in that particular place would have to be below three feet. Additional soaking perhaps would have done there, because it was a loose sedimentary soil. But on a hard soil you have got to help it and a subsoil or dynamite is about all that can do it.

Mr. Sprague—I wish also to add my testimony. While farm adviser for Orange County, my attention was called to an orange orchard that had produced very heavily in previous years but several of the trees looked sick and the crop was poor. That crop to which my attention was called, I investigated the condition of the soil, and while at the surface it seemed to be well irrigated and sufficiently moist, I was able to show that at a depth of twelve inches, it was really very much too dry. And going down from that, it was exceedingly dry; so that while he was irrigating the surface of the orchard thoroughly well, it was being very thirsty indeed in the reaches where most of the roots were

feeding. By the application of the subsoil plow at about the middle of the row, and crossways also, the moisture was gotten down and the trees recovered. I know of one case several years ago that was reported to a southern California farmers' institute during the administration of Professor Cook, in which there had been recommended for the condition of the soil, where there was a deterioration of the trees, that the orchard be deeply plowed every other row, and then the following year that the row which had not been deeply plowed, should be deeply plowed. The experiment was made and the orchard was given as much irrigation as it would take, and the trees did not wilt. They maintained a fair crop, and the next year and the year following that, the report was exceedingly good from that orchard. The rootlets that were destroyed were of no particular account after a year, because they put out again abundantly when the soil was moist at a greater depth.

The Chairman—I have not found that it worked that way in lemon trees. We plowed deeply and subsoiled without being able to see that it hurt the trees at all.

Mr. Waite—How much subsoiling was done on this orchard?

Mr. Koethan—The orchard was subsoiled a little over three feet, both ways through the center, and the water was run through the subsoil, but inside of a few weeks, the orchard began to wilt, and on investigation they found that the water had not soaked, and that the portion containing the roots of the trees was absolutely dry. Therefore, I say, be careful how you subsoil.

The Chairman—Why should it be dry?

Mr. Koethan—They applied the water through the subsoil furrow only.

The Chairman—That may have been the difficulty.

The Chairman—I would like to call your attention to the exceedingly interesting program provided for tonight, and urge you all to come out.

(*Thereupon the meeting adjourned until May 29, 1919, notice being given of the addresses to be delivered at 8 p.m., May 28.*)

Wednesday, May 28, 1919.

Evening Session.

Hon. G. H. Hecke, presiding.
Meeting called to order at 8 p.m.
The following addresses were rendered:

"Federal Plant Quarantine Work," by Charles L. Marlatt, Chairman, Federal Horticultural Board, Washington, D. C.

"The Trend of Agricultural Prices," by Thomas F. Hunt, Dean, College of Agriculture, Berkeley, Cal.

"National Price-Fixing of Foodstuffs and Its Results," by G. Harold Powell, General Manager, California Fruit Growers' Exchange, Los Angeles, Cal.

[EDITOR'S NOTE.—No stenographic report of this evening session is available, and unfortunately none of the addresses were committed to paper, except that of Dean Hunt which follows.]

THE TREND OF AGRICULTURAL PRICES.

By THOMAS FORSYTH HUNT, Dean of the College of Agriculture, University of California.

It is now pretty thoroughly understood that the general increase in prices is related to the amount of currency and other instruments of credit in circulation. The dearness or cheapness of any particular commodity is not determined, therefore, by its price in dollars and cents, but by the amount of other commodities it will purchase.

Various indexes are used to determine price levels. I have chosen Bradstreet's index of the wholesale price of 96 commodities, because the prices of farm products with which I shall deal are wholesale prices. This index was 210 in 1918, as compared with 100 during the five years preceding the war. Thus, during 1918, no commodity was high unless it was twice the price of prewar times. The highest price level was 215, reached in July, 1918. By March 1, 1919, it had fallen to 193. In general it has held at about that level ever since. On May 1, 1919, live stock, however, had reached the highest level on record. Usually, new price levels occur a few months after a new bond issue, because new credits are established. It will be interesting to observe whether the new Victory Loan operates in the usual manner.

The general trend of prices indicates that during 1917 the price of crops and live stock rose faster than did farm wages and articles farmers buy. In 1918, however, farm wages and articles farmers buy rose much more, relatively, than did the price of farm products. While the money value of farm products was higher in 1918 than in 1917, relatively prices were less favorable to the farmer in 1918 than in 1917. If the five years prior to the war, 1909 to 1913, be taken as 100, then the value of farm land in 1918 was 167, farm wages 172, the average price of crops and live stock 209, and the articles which farmers buy 202.

Contrary to the opinion of many sincere people, in general the wholesale price of farm products during 1918 has not been high. The prices have been strictly related to the amount of currency and other instruments of credit and to the prices of articles which farmers must buy in the conduct of their business. It is true that farm wages have not risen quite as rapidly as the price of farm products. This, however, is of less importance than would at first seem, since three-fourths of the labor on American farms is performed either by the farmer himself or some member of his family. While there has been, in the aggregate, enormous increase in the capitalization of American farms during the war, expressed in dollars, yet if these farms were converted into dollars, the dollars would not buy as many commodities as could have been bought with the proceeds of these same farms prior to the war.

Naturally, some farm products rose more rapidly than others during the war and some have receded much faster since the signing of the armistice. On March 1, 1919, wheat, corn, beans, hogs, sheep and wool were somewhat above the general price level. Wool, however, is the only one which was strikingly above it. Barley, oats, hay, potatoes, butter, milch cows and horses were well below the general level. Horses were less than one-half the relative value of other commodities. Horses are both actually and relatively cheaper than they have been in years, notwithstanding the prices of farm horses in France and England have been from two to three times the prewar price. On March 1, 1919, the average price of barley was one-half that of eleven months ago. Beef cattle, cotton and eggs were about normal when compared with the general level of prices.

Authorities generally have hesitated about making any predictions based upon previous wars, since this world war transcended all other wars in the number of countries and the variety of interests involved. The magnitude of the cost in money and life having been beyond all previous knowledge, the after-effects may be beyond all previous experience. It is of some moment, nevertheless, to observe that the length of the Civil War and that of the recent world war were practically the same, and that the inflation of commodity prices during the war was identical

when compared with the five years preceding each war. If this be a coincidence, it is a most extraordinary one. While one must not be hasty in drawing conclusions, it will not harm us to know that commodities lost two-thirds of their war prices within six years of the close of the Civil War. Return to their prewar levels took about thirteen years.

As stated at the beginning, the new price level of 1918 is now generally recognized to be due to the amount of currency and other instruments of credit in circulation. Is this a new permanent price level such as has occurred in history before, or is the price level going to fall in the course of a few years to the 1913 price level or even to that of 1896? Professor Plehn of the Economics Department of the University of California has pointed out to me that, at the close of the Civil War, when the United States was on a currency basis, the European countries were on a gold basis, to which we returned later. Now the European countries are on a currency basis. Perhaps the United States is nearer a gold basis today than any other country. If so, what effect is this going to have on the rate at which its currency will be retired? Irving Fisher, professor of economics, Yale University, is of the opinion that the general level of prices is not going to fall much, if at all. He believes we are on a permanently higher price level, that is, for many years. Indeed, he indicates there are factors favorable to an even higher price level.

On the other hand, referring to the panic of 1873, Horace White, a writer of the times, said, "The appearance of prosperity immediately preceding the panic is so deceitful, the activity of trade and the upward movement of prices so exhilarating, that the tornado always finds us with every inch of canvas spread, all the ports open and the crew fast asleep." Which is the correct view? It is possible that both may be correct.

These have been prosperous times for the farmers who had contracted debts prior to 1914. In 1918 they could pay their prewar debts with one-half of the commodities that were required during the five years preceding the war. To that extent the farmers have been making money. It is one of the cases where it is fortunate to be in debt. If a farmer contracts a debt now to be paid fifteen years hence, and in the meantime the prices of his commodities return to prewar basis, it will require twice the commodities to liquidate it.

However, so far as current expenses are concerned, the farmer is not so much interested in the general level of prices as he is whether the prices of what he has to sell rise or fall faster than the commodities he must buy. If one really knew what was going to happen to the price of specific articles, it would be comparatively easy to become many times a millionaire. All it would be necessary to do would be to sell long or short, as the circumstances required. I sometimes watch the billiard players, but I do not understand the game. I can see the forces which move the balls, but I can never tell which direction they will take. Perhaps some day I shall learn to play billiards. Not until then shall I prophesy.

Notwithstanding, it may be pertinent to recall some of the well known features of agricultural progress during the past half century. Between 1860 to 1910, the population of continental United States increased a little less, and the number of farms increased a little more, than three times. Which will increase most rapidly in the next half century? Will the number of farms be tripled during that period? The land in farms now occupies about one-half of the land area of the United States. During the decade ended 1880, the improved land in farms increased slightly over 50 per cent. How much will this area increase in the decade ending 1930? How rapidly will we increase our importation of food? Whence shall we import it?

The labor cost of producing farm products has in many cases been greatly reduced through the introduction of labor-saving machinery. Some genius for statistics has determined to his satisfaction that between 1855 and 1894, the time of human labor required to produce a bushel of Indian corn declined from 4 hours and 34 minutes to 41 minutes. In like manner, it was found that the required human labor for a bushel of wheat declined from 3 hours and 3 minutes to 10 minutes. While these figures are open to question, a great reduction of human labor, when applied to the production of food, is well understood; better, perhaps, than the consequences. There were three direct consequences. The price of products declined. Farm wages increased. It required a larger farm to produce a given gross income. The rate of farm wages declined between 1866 and 1879 when stated in currency, but, stated in gold, there has been a general rise in wages

ever since the close of the Civil War. Thus, using the gold standard, the average monthly wage without board was $15.50 in 1866 and $25.46 in 1909. In 1918, it was $47.07. The readjustment of the size of fields to labor-saving machinery was made possible through the development of the United States west of the Mississippi River during the last three decades of the last century.

Does anyone foresee a similar reduction in the labor required to produce agricultural products? The human race can not in the long run consume more than it produces—a fact which we are just now in danger of forgetting. Our material welfare consists in efficient production, which means a large production per unit of labor; in equitable division among all the individuals concerned in its production; and in wise consumption. Efficient production, equitable division and wise consumption constitute a trinity that leads to prosperity. Too much emphasis, or shall I say too little emphasis, must not be placed upon any one of them. A great many economic theories break down because one or the other of the three is overlooked.

There have been changes in food habits. A striking illustration is sugar. In 1870, the people of the United States ate less than 33 pounds per person annually. In 1914, they ate more than 89 pounds each. The wholesale price in the first mentioned year was 13 1-2 cents, and the last 4 2-3 cents. During less than half a century the consumption of sugar increased three times. The cost was reduced to one-third; hence, the annual wholesale cost was nearly the same in both instances, being $4.42 per person in 1870 and $4.17 in 1914. For 1918, the wholesale price of the sugar consumed per capita had risen to $6.03.

During this same period, there has been a great increase in the consumption of fruits, which are a glorified form of sugar. There are many persons now living who can remember the time when an orange on Thanksgiving or Christmas was in the same category with turkey and plum pudding. Will prohibition bring about changes in our food habits? To what extent will prohibition increase the consumption of cream, sugar and fruit? Will sugar beets displace barley? An acre of sugar beets in California will produce 4,000 pounds of edible food. An equally good crop of barley will produce 800 pounds of human food. What effect will the change, if it occurs, have upon the density of population, upon the price of land, upon the demand for fruit? Is the fruit grower going to have his innings?

The United States has become a creditor nation. When the United States was a debtor nation our stocks and bonds were held by people who lived in Europe. What became of the dividends? They were spent in Europe for food, clothing, shelter, education and recreation. These dividends created a demand in Europe for fresh eggs, spring chickens, winter lambs, hothouse grapes and Seville oranges. Vast quantities of these same stocks and bonds are now held in America. What will the owners buy with the proceeds of these coupons when they clip them?

During the war the United States sent out to our allies food, munitions and other commodities for which we accepted their notes to the extent of several billion dollars. Evidently, these notes must be redeemed with interest in commodities. What commodities? Obviously, they must be commodities which our allies can produce. Equally certain, they must be commodities which we desire. Will they be manufactured goods or food? What effect will this have on the relative price of fabricated articles as compared with food and other raw materials? Will this balance of trade which must take place sooner or later occur rapidly enough to affect materially the price of the things the farmer has to sell as compared with those he must buy?

Doubtless it will sooner or later become apparent that under modern conditions it no longer pays the people who live in cities to engage in war, not even if they win. When that fact becomes thoroughly understood we will no longer have wars except in those countries where civilized society does not obtain.

Thursday, May 29, 1919.

Morning Session.

Hon. G. H. Hecke, presiding.

Meeting called to order at 9.30 a.m.

The Chairman—The Convention will please come to order. I am particularly pleased to have the honor of having Mr. E. A. Chase of Riverside as presiding officer this morning. Mr. Chase of Riverside is one of those pioneers who has been doing so much work and labor and has been sparing no effort in putting the plant industry of California on the map. Mr. Chase came here at the beginning—about 1891, and as a nurseryman his handiwork is known from Siskiyou to San Diego. Many of you are county horticultural commissioners, and, as George Roeding humorously puts it, you may be classified as necessary evils. As a nurseryman Mr. Chase naturally came into contact with some necessary evils, and I am very much interested in hearing some of the stories that Mr. Maskew, who had his dealings with Mr. Chase, and our friend Mr. H. P. Stabler of Yuba City had with Mr. Chase in the beginning when the nurserymen did not understand the functions of a horticultural commissioner. The relations between the two have become a great deal better, but still there are misunderstandings. But from the testimony of Mr. Maskew and Mr. Stabler, I know that the amount of good that has been done by Mr. Chase in producing trees for the early plantings of California has been enormous, and I am proud to be able to present to you Mr. Chase, who is your chairman this morning.

Mr. Chase (now presiding)—LADIES AND GENTLEMEN, FARMERS, HORTICULTURISTS, NURSERYMEN, CULTIVATORS OF THE SOIL:

Mother Nature in some sections of our domain has produced food products on which races have lived, but no such race has ever reached civilization. Civilization has only come through labor of brain and brawn, through toil and sweat of brow. All that we have done, all that gives us our pleasures and comforts, our great wealth and resources, has come through labor, and you, in the cultivation of the soil and production of food, have made this possible. It could come in no other way. You have kept apace in the great onward march, and kept apace and done your duty. I desire to take you back through some past years, nearly a century, and bring you down to this time to show you what has been done. We have lived in the greatest era of the world's history. There has been greater advance in art and science, in discovery and invention, during the past century, than in all the preceding centuries known to history. Going back less than a century, the only forces which assisted man in his labors were wind and water. Steam had just commenced to percolate through the brain of man. The great forces of gas and electricity lay dormant in Nature's great storehouse beyond the reach of man until comparatively recent years.

The great territory this side of the Rocky Mountains, eighty years ago was little known by the white man. California at that time can hardly be said to have been on the map. The whole commerce of this territory at that time was in cattle, and the only products saleable were horns, tallow and hides. The whole yearly output of this whole dominion here

at that time could have been carried on one such train as we now see going by scores and scores daily, carrying the products of this state to the markets of the East. I must tell you a little incident about the nursery business here that you may see what great changes have taken place. In 1874 it was that a nursery company in Rochester, New York, received from some ranchers near San Francisco, a letter containing a $50 bill, asking that this nursery company would send to them as many apple trees one year old as they could for the money and pay the post. These trees were done up in packages of four pounds, with postage probably $25. A little later, from that same point, they received an order for one thousand Bartlett pear trees. These trees were not sent through the post office but over the railroads at pretty heavy expense. You do not now go East for your nursery stock. It is here produced in greatest abundance, and no country in the world can produce better stock and cheaper stock. The great bean business of this state—when was the first car shipped? I don't suppose there is a man here in the city that knows it was shipped in 1882. Mr. William McCord, a seedsman near Medford, Connecticut, being interested in seed growing here, and seeing a few lima beans in a store in San Francisco, became much interested, because that seed had always been short of the demand in the East. He inquired and found that it came from near Santa Barbara. He immediately started for Santa Barbara, taking the railroad at that time to Saugus and stage from Saugus to Santa Barbara. He found a man and he inquired and after considerable conversation he agreed with him that if he could pick up a carload of lima beans he would take them. In due time the beans were secured and forwarded. The beans were a pretty measly lot; they had been badly harvested, badly threshed, much broken and very dirty. And if it had not been for the circumstance that he was able to sell the broken beans to the penitentiary in the neighborhood for the making of soup, he would have had a loss. But that was the commencement of the great bean industry of California.

The seed business of this state was commenced in the fall or summer of 1874. A young man from Canada, a Scotchman from Canada, crossed the lake to Rochester, New York, where he was employed by a seed-grower. Learning the business, he commenced business for himself and conducted it for some years, when he was obliged on account of his health, by the advice of his physician, to come to California. He settled in the Santa Clara Valley and not being sick enough to die, he scratched the ground and found that seed growing in California was a pleasure rather than hard work. That was the commencement of the seed business in California.

Transportation, back eighty years ago: The only mode of transportation on land was the horse and the ox. It was before the day of railroads. The only Concord stage coach that used to roll through the turnpike from St. Louis to Washington was a very passable vehicle, and the congressmen sitting on top thought they had the world by the tail. That is all gone. The automobile has come in a very recent time. I don't know as there is anything that has given more pleasure to a greater number of people—given more satisfaction, done more to give pleasure and delight to the thousands—than this vehicle. It has been a great machine for opening up the country. It is but a few years ago, I think,

that people thought of the wonders that came through that machine, for it opened up the country that they otherwise never would have seen. It is but a few years ago that I chanced to be on a grand jury in the city, and I said to them, "When we get through with our work I will invite you. I will get a tallyho and take you all out and show you Riverside." Here is my friend Mr. Holmes, the editor of the paper here, one of the early pioneers, and told him I would lose him in two miles of his home. He smiled ironically, but we went out and when we got less than two miles from Mr. Holmes' home where he lived for some fifteen or twenty years, he said, "Mr. Chase, I give up; I never was here before. I am going right home and bring my wife out here to see this country that I have never seen before." When I was living in Rochester, where I lived for 25 years, I never went, except on a railroad, six miles west of Rochester. I had no business there and it was too much work because it was not the fashion for the people to think of traveling anywhere just to see the country. They had never been in the habit of it. They knew very little of the surrounding country. Men had grown up in that city and never had seen anything of the country around. If you go there today or to any city, the masses of people have become familiar with the whole country out around.

Now, the mail service back seventy-five or eighty years was not as good as it has been under Burleson's administration. A letter from Portland, Maine, to New Orleans, was conveyed for 25 cents. Postage from Boston to Portland, 12½ cents. There was many a village throughout the whole country that did not receive mail more than once a week, and that consisted principally of the weekly paper published in some city. So you can see what our mail system was. Perhaps it is not so bad at the present time as a good many would have us think, under even the Burleson administration. It is a great institution. If it stopped a week, we would all be lost. The flying-machine. How many were there twenty years ago who believed it possible that man would ever fly? I don't believe there was 1 per cent of the people who had faith in it. But it has been done, and it is going to stay. I have been told that Professor Bell, the inventor of the telephone, said there is the day coming when there won't be a rail on the surface of the earth. I am not so sure that he is right. He may be. We have been moving during these times at a high speed. We can not realize without looking back into the past how we have been moving, and you cultivators of the soil, producers of foodstuff, have done your full share and kept apace with this movement. You have been the pillars on which the great superstructure has rested, and you have been more. No class of men in the country have been more loyal and more steadfast in upholding the ship of state than you, and there never has been a time since the government was formed when your services were more required than at this very time. There never has been a time when things surrounding us from all parts of the world have looked so dark. The Bolsheviki, the I. W. W.'s and kindred associations are abroad in the land, and in the light and in the darkness their machinations and propaganda are going on. They seek to overthrow this great government, devised by greatest geniuses of time, that has ever been handed down, and under which every man has equal opportunity, has equal rights. It is this they seek to overthrow and establish a Bolshevik reign.

General Dix in the Civil War said whoever undertakes to pull down the American flag—"Shoot him on the spot," and like an electric shock that went through the hearts of loyal men and urged them to combat; and I say to you, whoever undertakes to pull down the American flag and destroy this government, deport him or shoot him on the spot.

"God of our fathers, known of old,
Lord of our far-flung battle line,
Beneath whose awful hand we hold
Dominion over palm and pine,
Lord God of Hosts, be with us yet,
Lest we forget—lest we forget!"

The Chairman—Mr. John T. McBean, Assistant State Director of the War Savings Organization, is called for on the program.

Mr. McBean—MR. CHAIRMAN AND GENTLEMEN OF THE CONVENTION:

It is not my intention to take up much of your time, but I just what to get before you the program for 1919 of war savings. I came here not to criticize, but to express our appreciation of the part that you have individually and collectively rendered in the campaign of 1918. Now that the war is over, the question is asked from time to time, "Why shall we continue war savings in 1919?" I recently had an invitation to speak at a luncheon and when I received the program, on the front page was the striking slogan, "Get the other fellow's viewpoint."

Now, as an introduction to 1919, I want the privilege to get the government's viewpoint for war savings for 1918. When we went into this conflict for the protection of your life, your property, and democracy, this nation was unprepared for war, and the first thing that it had to do was to outline a great campaign of preparation. To this end they had to bend all the energies of the nation, and you can appreciate the great difficulty that confronted us when the nation was not able to use the money appropriated during 1918, because of certain conditions. The matter of man power and raw material was important. War savings came out of that condition and the organization came out of that condition, and we started in a campaign all over this country, for what? Asking the people to sacrifice man power and raw material out of the nonessentials to the end that the government could have supplies and money for conducting the war. We contributed to that campaign individually and collectively, and just about the time the armistice was signed, we had reached the peak or about reached the peak. No person either over there or at home, who had the responsibility of winning that war, ever expected for one moment that we were going to win the war in 1918, but they did expect to win it in 1919, and had planned a drive in the spring of 1919. So this great campaign for preparation was to this end, and we reached practically the peak of that preparation about the time the armistice was signed; and you can appreciate how comprehensive it was when it involved the completion of sixteen million tons of shipping, when we were ready to place on the western front one of those steel tanks for every seventy-five yards, when we had sixteen million rifles, five hundred thousand cannon, with all the ammunition necessary. We were ready to make the sun dark over Germany, and cut a swathe

of 100 miles straight through to the very heart and soul of Germany. But, because of the effectiveness of our boys at Chateau Thierry, Belleau Wood and all along that western front, and with the knowledge that this preparation was just about completed in the United States, Germany quit. Now that the war is over and we have accomplished the purpose of the 1918 campaign, the question arises in the minds of the people, "Why war savings in 1919?"

Over there, the people that we have been associated with say that the United States accomplished the impossible in 1918, and they are now asking the question over there, and thoughtful people are asking the question over there, "Can the United States stand the recoil? Can we go successfully through the campaign of readjustment and reconstruction?" Now, we can not accomplish the end if we go back and continue the title that we had prior to the war, that we were the most extravagant nation on the face of God's earth. So the great thought for the 1919 campaign is a campaign of individual, community and national prosperity. That is the 1919 campaign. Not a campaign of sacrifice out of nonessentials, raw materials and man power, as in 1918. So, to this end, we are asking that you save systematically, and that you buy wisely, that you contribute your part to the great national fund for the campaign of prosperity in this country, the like of which we have never seen before.

Now, it is not necessary for me to discuss thrift with you people. You know what it means. So let us assume that thrift is a fact in the sense that we must be thrifty in order to accomplish the end for which we are reaching.

Now, it is very well for us to accept the theory; it is very well for us to see the effect of it; but the problem that arises is—How can we make it a reality? And in trying to make it a reality, we are confronted with certain conditions. For an illustration, I often hear the question asked, "Will not war savings in 1919 interfere with our business?" That depends largely upon the man who is asking the question. If he is a business man, but so narrow minded that he can not see through a pane of glass, if he thinks and prays nightly, "God bless me and my wife, my son John and his wife, us four and no more," certainly from his viewpoint war savings will interfere with his business. But if on the other hand, he knows conscientiously that no man liveth unto himself, that through a campaign of thrift and savings there is an accumulation of wealth in the community for business purposes, then he begins to realize that he of necessity must get his share of the returns. And then there is another thing that we have to confront, and that is, that everybody must spend every cent he has. That theory has been long exploded. If we spend every cent as we go, it would be impossible for us to get the most out of life, and so I might go on stating these incidents that confront us in this thrift campaign. On the other hand, there must be a campaign of education. It is all very well to say this is a campaign for school children. In 1918, when we went into that campaign, we were told that buying thrift stamps and war savings stamps was a child's game, but when the cry came over the country for the preparation for war, people realized that it was for the grown people and war savings was applicable to them. All very well. But let us have thrift in 1919. But some people will tell us, let us go with our thrift to the schools.

We grown people want to go back to business. Let me tell you. We can put thrift effectively in the schools. We have done it in the schools. But we must reach the person outside of the schools. A child goes to school without reason; he is sent there by his parents and by and by because other children go to that school he continues to go. It is all discipline at first, but by and by the child commences to achieve and he goes on and on until harmony comes into his life and he becomes responsible, and out of that condition comes the best interests of the child. So we can go to that school and carry thrift to that school, and as a result of our work, hundreds of thousands of thrift stamps have been purchased by the children throughout California, and they will continue to be purchased. It may be interesting for you to know that we are organizing war savings societies in schools, and we have application blanks that go into those schools, and it may be interesting to you that of 300 cards that we received from the Pasadena High School, they have averaged over $15 for that year. It might be more interesting for you to know that out of approximately 300 cards out of the Polytechnic High School they have averaged approximately over $30 per card. The school children have already committed themselves to $30 apiece; and so I could go on and bring before you what the school children are doing. Now when we come to the grown-up person, it is a different proposition. We have got to establish a system or a plan whereby we can start that individual to saving systematically each week. So out of this situation—in contrast last year we started out with the thought of having a drive and spectacular sales. Nevertheless they did help along last year. The plan this year is to wipe that off the earth. But if we are to have individual, community and national prosperity and thrift, and thrift is the foundation of the same, the thought is to organize among grown-up people war savings societies. Let the individual sign that application blank as a matter of discipline, if for nothing more. Not to sign it to give $500 and then go to the savings bank and take that out and buy the stamps; that is not the thing. That is not savings; that is diverting. Let us commit ourselves to something—a dollar a week or fifty cents a week, and then when we have committed ourselves to something, let us save that systematically each week, and by that we will build up a fund that will go into business and into national enterprises. Do you stop to realize that heretofore that when you wanted to do big things in this country and wanted big money, all you did was to fix up your bonds, take them over to France, the pawnshop of the world, lay your bonds on the table, and they gave you the cash? You can not do it any more for two generations. Therefore if we are to give employment and develop our resources and continue to build up this country, the money that we put in these big things must come out of the actual savings of these people.

We don't expect for a moment to get all of these savings in war savings stamps. We did not in 1918. Do you stop to realize that the Pacific coast states, or this district, stood third last year in the sale of war savings stamps? It was close to the top. Do you stop to realize that during the last four years, notwithstanding the war, the savings accounts have increased in our savings banks and trust companies in the Pacific coast states something like 46 per cent? Business will get these

savings. The money will come into the banks and out of the banks into legitimate business and into great enterprises. What I want to say is this: We want your co-operation to the end that we can establish savings societies in every business house, in every shop, in every factory, in every community, and we would like to establish these societies in every precinct in the whole of our territory. We make a boundary line because we must divide our territory up into districts. When we came to the June drive last year in Los Angeles County, we assembled in the Shrine Auditorium not less than 3,500 people who were presidents, secretaries, captains and lieutenants of war savings societies, and the representative of the war savings organization at Washington was enlisted at that time and sat on the platform, and he said: "I have seen meetings in New York and Chicago, but never have I seen a manifestation of an organization like this."

We went out and started into that pledge drive and it was made a success. We want to perfect that organization all over our territory, and I want you men—you men who do things and accomplish results, who have the intelligence and energy—to advance and co-operate with the chairman, wherever you live, or the county chairman, or the city chairman, and help us perfect war savings societies everywhere, and for discipline let men and women commit themselves to some amount, small though it may be, and it will start them right and by and by they will continue to save because they will begin to appreciate what savings will do for them. Gentlemen, I thank every one of you.

The Chairman—Mr. Mark Grimes is the next man on the program.

Mr. Grimes—MR. CHAIRMAN, LADIES AND GENTLEMEN:

It is in the thought somewhat of someone representing a luxury, to speak after the patriotism and war savings address which we have heard. I believe that strawberries, particularly this year, are a luxury, and they are probably the highest luxury that we are able to sell from this state. Quite an interesting picture and a contrast with the berry business four years ago in California, and today. Four years ago when I completed a harvest of my berry crop in Santa Clara County, I was compelled to take my sales account to the bank in the little town where I lived and exhibit the same to the cashier, and I was compelled to make the humiliating statement to that cashier that I was broke, and that I was not only broke but badly in debt. The bank had already loaned me money to start in business, and I was compelled to appeal to that bank to make a new loan over and above the old one, or to take my ranch. After going over these sales with the cashier, he said to me, "It is a funny thing. You have sold 22,000 chests of berries and you have not come back the cost of harvesting that crop." I said to him, "Am I any worse off than the other berry growers in this same district?" And he said, "No, you are not. They have all been here telling practically the same story." The strangest thing about this proposition was: We are fifty-five miles from San Francisco and the bay cities, one of our largest markets. The price of berries to consumers in the markets of central cities was a good price, and if we could have received two-thirds of that price, we would not have gone in debt. It therefore was apparent to any man who wanted to look over the situation, that there was something

wrong between the producer and the consumer; that the system of distribution and selling this product needed some sort of a revolution. The berry growers met and discussed what should be done to help us out, and that was the beginning of the organization known as the Central California Berry Growers' Association. I can safely say that no co-operative marketing organization in California was put over with so small an expense, and in so short a time as that association. The reason for it was this: when you went to a man with a contract, he knew that he could not be any worse off than he was, and therefore he could take a chance on anything, and therefore he took a chance with the association. Today, we have 98 per cent of the berry growers in the organization. That is a pretty strong percentage. Perhaps we have the strictest control of any co-operative marketing organization. We have been taking about from $1.75 to $2.75 per chest of 60 pounds. We sold them to the canneries as low as a cent a pound—for as low as $1 per chest. It cost $3 a chest to put them on the market, so you have some idea what we were losing. This year, with the largest crop ever on record in our district, we have not only sold all this year's crop for the highest price ever paid, but have sold one-third of next year's crop at our opening price. There were a good many factors other than organization that have contributed to that success, but those factors would not have contributed as strongly to our success if we were disorganized.

It is not so much an effort on the part of the association today to sell the product, as it is an effort on the part of the association today to give the consumer a square deal. The State Horticultural Commissioners have recently found all the representatives of the berry business in California, in Sacramento, asking the state legislature to adopt a standard shipping package for the use of berry growers of California. We have met with considerable opposition in getting the legislature to adopt that standard package. What we are trying to do is this: we are trying to have a standard package which will comply with the law and be uniform throughout the United States for shipping berries. So that no matter into what market you are offering to sell your product, there will be only one size package to ship it in, and the consumer will know that he is buying a certain size package, and buying so many pounds of berries no matter where they are coming from. We are trying to get a package adopted in which the consumer will receive the maximum protection. We are using in central California, a small basket containing eight ounces in order to comply with the law and put eight ounces in that basket. It is necessary to pack and face the berries. It is human nature to put the nice berries on top. As a consequence, it is a deception and a fraud on the public. We want to do away with that and by the action of the legislature, we have practically done so.

We find we are confronted today with the problem of trying to keep the price of berries down where the consumer can afford to take them. No association has come here to tell you such a story up to this time. As an actual fact, the association is trying to hold the price of berries in San Francisco today at $10 per chest; 10 cents per basket, 8 cents to the consumer, and if it were not for the efforts of the association, the price of berries would remain at $14 and $15 per chest of 60 pounds. The reason for that is this: there is in this country today the biggest demand

for canned fruit and canned berries that we have known. We have sold all the berries we care to sell, and we can sell the whole crop for 14 cents per pound net to the grower on his ranch. We have sold one-third of next year's crop on that basis, our opening price. Now, that price will mean $14 or $15 per chest on the markets to the consumer, but if we raise it to that price, if we bring the law of supply and demand to operate in this case, we will at once antagonize the consumer. The San Francisco public will be up in arms against the association. It would take time and lots of money to convince them that the organization is not responsible for that. I am reminded here at this time of the terrific antagonism against co-operative marketing associations by a senator in southern California making the statement that the associations were organized primarily to sting the consumer. I am forcibly reminded that they said the gentleman was not acquainted with the facts in the case; that he had not made any investigation of the actions of all of the organizations.

If we withdrew today, the efforts of the Berry Growers' Association, the consumer would at once pay one-third more. But as it is, it gives the consumer his supply of berries at a price he can afford to pay. That has been the effort of the association, regardless of the few dollars extra that we could make by withdrawing and permitting the law of supply and demand to operate. In this connection, the association is handling at a very small expense, all the berries. Last year the expense to the shipper of the berries of the association was $\frac{5}{8}$ of 1 per cent. It is so small that the average man did not know he paid the association assessment. He imagined that he had a slight increase of freight rates, of 2 cents or 3 cents a chest.

Yet we have been able, not only to save the very industry, but actually to take every man in the business out of the clutches of bankruptcy, and put his business on a profitable basis.

The first year the organization was in existence, we named a minimum price on berries. The cost of berries plus a reasonable profit. We said to the dealers and to the public, that we must either get this price or we will plow up our vines. We could not work for less than the cost of growing. Many people said we could not arbitrarily fix any price, no matter what the reasons were, or what the cost of production was, but we did. The average man is intelligent enough to know that he needs a supply of fresh berries and vegetables, and that in order to get that supply, he must pay the producer a living wage. We did not trust to the intelligence of the average man entirely in bringing this about, but we made a survey of every market in which the berries are sold, and we ascertained exactly how many pounds of strawberries and bush berries could be consumed in every one of these markets. Every day then, we set about to supply those markets that amount of berries, and whenever we had a surplus over and above what these markets could take, we kept that surplus off the market for whatever we could get. We endeavored to give it to the canneries at practically what it cost to pick and put on the market, not only because we wanted to keep it off the market, but because we wanted to build up a demand and create an outlet for this product. Our three years following that policy has worked because the canneries using these cheap berries have in the three years created a

tremendous market for jams and jellies, whereas four years ago the canneries could only use about 10 per cent of our crop. Today they are willing to take 50 per cent and 60 per cent of that crop, and it has been a big benefit to the berry growers, because we have not only a market for the fresh product, but we have today an unlimited standing outlet for it. We prophesy today that the production of berries in California will almost double within the next year. We can market that crop at extremely good prices. There will be absolutely no question as to our ability to find a market for them.

Now, we have not built up an elaborate machine to handle this crop. We have for the most part, made use of the existing organizations and marketers to market the crop. The producers' association has entered into a contract with the leading shippers of the state, and they market the berries under the general direction of the organization. We simply make use of their facilities, their experience, their packing houses and their shipping ability. In other words, we have organized the shippers to distribute this product with us, they furnishing the capital, the experience; they furnishing the men, the packing equipment, and all that goes with it under the general direction of the association.

The grower takes no chances in any way. He invests no money. He does not even pay for baskets in which he ships his products, until after the product has been sold. It seems comparatively simple, and it only goes to show one thing: that if you organize the producers, you can protect your market and market at satisfactory prices.

At this time I have also been asked to say a few words concerning the vegetable organization which I also represent. Almost the same plan is being used by the vegetable growers' organization of this state. The vegetable industry, of course, is a great deal larger and a great deal more important than the berry interests. In 1917 the total combined value of the vegetables of this state was approximately $65,000,000. It is conservatively figured this year that it will be $120,000,000. There are about 20,000 people engaged in the production of vegetables in this state. No line of industry needs protection as badly as the growers of perishable products. Taking oranges as an illustration, you have a few days freedom in the marketing of the orange crop. You are not driven to accept the market price today or tomorrow. But the grower of the perishable product is at the mercy of the market today. He can not hold his product. In other words, there is more demand and more need of organization for collective action by the growers of perishable products, than in the growers of any other commodity. A system must be devised which will give the growers of vegetables and berries the widest possible distribution, and give them the advantage of the market throughout the United States every day, because they can not wait a minute for the sale of their product. I was reminded in the last few days of what the Vegetable Association has done for some cabbage growers. A trade war was started in Kansas City. The price of cabbage was ranging from $70 to $80 a ton. A trade war started in when some shippers ran the price down to $35. The growers out of the association sold at prices ranging from $30 to $40 a ton. Practically a third of the crop outside of the association was bought at those prices. The association went to the growers during even that interval when the price was run down,

and it will return to them $62.50 a ton. It illustrates very nicely the point I am getting at—that the vegetable shipper and the berry shipper is the victim of a vicious and, in many places, a dishonest method of distribution.

A few years ago I was talking with one of the largest dealers in Chicago, and I said to him: "I see that you have your sign on these products, after you have bought them, that these are on consignment. If I am correct, the same product was shipped to you by the same man. How does it come that you own this, and you are selling this on consignment?" He said: "I have purchased this part of the product which I want and I will sell the rest on consignment. I do not feel that I am justified in buying it all." He simply sized up the market in the morning and figured that it was probably due for a rise. He bought half of the product in order to take advantage of the rise and the rest he was selling on consignment. As a matter of fact the market did advance and he charged 10 per cent on the product which he had bought and he sold it at an advance of about 30 cents a crate. Two years ago we had a lawsuit with a firm. We shipped them lettuce, and our returns were 35 cents a crate. We bought back our own lettuce for 85 cents a crate.

Mr. Powell stated here last night, when you are shipping on a falling market, 90 per cent of the shippers will be unable to pass inspection. We have potatoes which passed the heaviest inspection ever put forth in California, rejected in Kansas City. When we threatened to bring in the original inspectors, and to go to court with this thing, they accepted the inspection and sold them. I could go on and recite here for an hour certain of the trade practices, the evils of the present method of distributing vegetables, which the vegetable producer is confronted with today. Not all the men engaged as commission merchants and shippers are dishonest and not all of them take advantage of the shippers, but they are also the victims of the bad system which they alone can not change and correct. And going back to Mr. Powell, who said these things can only be wiped out by the producer himself, I think that is very, very true. In the organization of vegetable growers, we have permitted the growers in every district to select the marketers that they prefer to do business with. Those marketers sign an agreement with the association which gives the association general authority over the direction of these shipments, and the formation of rules and regulations, governing the sales of the shipments. We organized the marketers on one hand and the producers on the other hand. The shippers put up the packing houses and furnished the money for crates and boxes, pay the freight and refrigeration at actual cost. The grower is not called upon to supply a dollar. He simply organized to protect the marketers and get a square deal in the markets of the United States. He organized in order that the association together with the marketers can create the widest possible distribution of his product, and so that we can take advantage of all the good things which result from national and collective advertising. I can not but help call your attention to the artichoke growers of California. It may surprise you to know that 92 per cent of the artichokes grown in America are grown in California, and they are by far the finest quality that can be had in America. They are sold today in two cities, Philadelphia and New York. In other words, they

are placed into the hands of two marketers and the producer is exploited beyond my ability to tell you. No effort whatever is made to widen out the market and increase the consumption and build up this business which California holds an absolute corner on. It is beyond any conception of good business to permit such a thing to continue. We could build on the artichoke business alone a world-wide reputation for California vegetables. We could distribute them all over America, and yet nothing whatever has been done in any way. We can double and treble and go on and increase the artichoke production with unlimited demand for it. The same is true of your lettuce. You raise the finest head lettuce grown in America. This year in the big demand for lettuce, the shippers went out and bought lettuce that was green before it was matured and shipped it into the market and gave the lettuce growers of California the worst black eye it ever had in twenty years. Now, who will suffer? It is the grower, and it is going to take several years to restore the confidence that we had in lettuce dealers throughout the Eastern markets. Now, it is this kind of thing that the organization can eliminate, and it is this kind of thing that we are trying to eliminate in the vegetable organization. The man who must grow vegetables in order to live is facing conditions which are terrible. The vegetable association has a state board of directors of seventeen men, eight of them from southern California and eight from northern and central California. It has nine branch offices. Each branch office is in the middle of a local vegetable district and controlled by a local organization of a local board of directors. A local board of directors has general supervision over all the vegetable business coming through the association in that district. They have a right to name minimum prices for canneries, methods and manner of shipments, establishment of warehouse and receiving stations, specifying the marketers they wish to do business with, and the canneries to which they wish to sell their surplus. They employ a local secretary-manager who is also an employee of the state organization. We have the local organization benefits, but we have a contract of the grower direct with the state organization, because, dealing with so many foreigners as we do in the vegetable business, it is a prime necessity that we have an enforcible, ironclad contract with the grower. Another thing, dealing in a product so highly perishable, we have to have an agreement which can be forced in any court in California. Therefore our agreement with the grower is directly between the state association and the producer. But the handling of the business is delegated by the state organization to the local organizations throughout California. It is not necessary for the vegetable association to control any particular percentage of the crop, because its method of marketing will market whether we control 10 per cent, 20 per cent or 50 per cent. The more we get the better control we will have and the easier it will be to put over standards of inspection, standards of packing, and regulations respecting quality. But with our marketing arrangements we can handle 10 per cent of the crop without any loss or without any risk to the grower, as well as we can handle 50 per cent. We will not be, with 10 per cent, in a position to make the market or to so widen and distribute the product that we can get the benefits of collective action. But we can sell that 10 per cent for as high a price as any other producer can get. So that in this association, as in the berry association, the producer in joining the

organization undertakes and assumes no risk and no responsibility. He has, in short, everything to gain and nothing to lose, and he knows very well that if he can build an organization to control and direct the marketing of his product, that he is sure to gain benefits and win in the long run. Now, on behalf of the new associations that I represent here today, I am glad to thank you for the invitation which I had and the courtesy extended by the Horticultural Commission, and I am glad also to say that it has been a splendid Convention. There is only one thing that could be better. I can not understand why this room is half big enough to seat the crowd that ought to be here.

Mr. Sprague—I don't know that there is any opportunity given for discussion, but I would like to say a word or two about this very interesting presentation. This presentation is certainly, to me, who have followed closely co-operative organizations for many years, a very novel one, and evidently working out very finely for the berry interests, where so large a measure of control has been obtained. Ninety-eight per cent is extraordinary indeed, but with the vegetable interests, Mr. Grimes says they are content to work with a much lower percentage, as of course they have to, the difficulties being far greater than in the berry interests.

But from experience of some years in southern Texas, in the vegetable growing district, I am profoundly convinced that California and that district in Texas will be going through troubled waters for many years until they find some basis by which they can secure a reasonable distribution of a product so perishable as the berry is. There have been efforts down there to organize, and they were on the wrong basis, a basis that I knew would bring disaster at the time, but they were unable to be persuaded and they failed. You know how difficult it is to organize again after a failure. But, nevertheless, a thing that is so essential as the proper organization of the vegetable interests must not be given up. Efforts must be continued, and I am hopeful that as the organization proceeds in California an effort will be made to reach that portion of Texas which looks largely to the same markets that California does, and secure a distribution management which will give a suitable market to its extremely perishable shipments, as has been done along other lines, with less perishable shipments. I think it is very encouraging indeed.

The Chairman—The next speaker will be Mr. Le Roy of the Claremont Pomological Society.

Mr. Le Roy—I have been extremely interested in this discussion by Mr. Grimes, and it is difficult for me to understand how any producer can be out of these organizations. My paper is along different lines—how to get the best production—as we have been trying to do in the Claremont colony for so many years.

(*Mr. Le Roy thereupon read his paper as follows*):

THE CLAREMONT POMOLOGICAL CLUB.

By V. V. Le Roy, Claremont, California.

Some years ago, I read a paper about the Claremont Pomological Club before the Fruit Growers Convention. Mr. Hecke thinks so well of our Club, and is such a believer in co-operation that he asked me to tell more about the Club at this Convention.

More local clubs should be organized to boost and co-operate in making practical use of the ideas presented in the many valuable lectures and addresses we are hearing from the scientific and practical men at such meetings as this. Many good things in life are lost because of our lack of application of things we know are true but don't put into practical use. Mr. Shamel, for instance, comes along from the U. S. Agricultural Department, and after careful investigation showed us that many of our groves had only 30 per cent profitable trees and very few have 70 per cent. A large number of orchards have more than 50 per cent of the trees that are being cared for year after year at a loss. This was six or more years ago. Our Club took the matter up and has ever since been urging the rebudding of all unprofitable trees. Everyone knows the advantage of co-operation in such things, to overcome the inertia which many have. It is very easy to let things go if you are working by yourself, but when working with our neighbors and friends we try to do our best. A boy always learns more and easier when associated with his fellows than when by himself he tries to get an education.

So, I have always been an enthusiast for co-operative organizations. But in this audience, I am sure no one doubts the advantage of proper organization. The main thing is to consider if it is worth while and will pay for the necessary work to keep it alive. The more one looks back on the life and work of Dr. Cook, the more we grow to appreciate his unselfishness in his activities for the public good. Twenty-two years ago he saw the great need of co-operation and organization in the Citrus Industry. He organized the Claremont Pomological Club and it has, through his work and inspiration, been a power for good in the San Gabriel Valley and state during these many years. Dr. Cook, about 17 years ago, also organized some 65 similar clubs in Southern California, when he was the University Institute conductor. All of them have fallen by the wayside except the Claremont Club. So long as Dr. Cook was able to devote his time to them, and give them his fire of enthusiasm, the clubs were full of life and several annual joint meetings of the clubs were held of great value, very similar to these Fruit Growers' Conventions. After he was removed from the Institute work for political reasons, the clubs gradually died. The Claremont Club alone remains and is a decidedly live wire and is doing a fine work. It has received many splendid compliments from the best of judges and its secretary receives letters asking about its work from many parts of the country. There are few up-to-date towns that have no social organizations or chambers of commerce. Why don't they have a Farmers Club? The farmer of the country is the foundation and backbone of all other business. At the beginning of the war he was told he must be patriotic and raise more produce to keep the allies in food and he responded splendidly. But do any of you know of a single food administration committee that had a farmer on it? Do you know of any farmer who is on the kitchen cabinet at the White House in the interests of the farmer, like Mr. Gompers who, looking out for higher wages and fewer hours, for organized labor regardless of patriotism? Do you know of any farmer who struck for an eight-hour day, during the War? If he had, do you know what would have become of the allied armies? No! The railroad men get more pay and shorter hours, while the farmer pays 25 per cent to 50 per cent more to get his produce to market. If the farmer expects to get anything like his share of the good things of life, either social or political, he must organize. Every section should have a farmer's organization which should work together. The Claremont Club has proved that such organizations can be made a power of good, and has been successful for 22 years, but for some reason such clubs did not hold together in other sections. The rancher has much less of contact with his fellows than other lines of business, and should cultivate it when he can. The farm bureau seems to be a splendid start towards a general organization and we are boosting it in every way possible. Three members of our Club are directors in three different centers. The following extract from a circular by B. H. Crocheron, head of the State Farm Bureau, gives these reasons why he thinks farmers' organizations have failed in the past: (1) the lack of a distinct purpose to fill a definite need. (2) Lack of membership, to sufficiently represent all classes of farmers and types of farming. (3) Lack of co-operation with other similar farm organizations. (4) Lack of continuous and unselfish leadership.

The enthusiastic active work of the Claremont Club for so many years has proven that the possession of the first and last of these attributes is absolutely

sure to produce success. The second I don't think at all necessary, but the third will undoubtedly be of great added value but not absolutely necessary for success. We have been working away in season and out, for 22 years, affiliated at times with other clubs and watching them die, but because of the constant presence of the two needs given by Mr. Crocheron, viz., a distinct purpose to fill a definite need and a continuous unselfish leadership, we have always been very much alive except for one year. In the nearly 20 years' service as secretary of the Club, 13 years of which was under Dr. Cook as President, I can speak from positive knowledge that continuous leadership is very essential. You will pardon a personal reference to prove my point. Twelve years ago, Dr. Cook planned to take a year's absence from his work and spend it in Europe. He persuaded me to go with him. A President and Secretary were elected in our places. When we came back, there had been no Club meetings for 8 months. Dr. Cook immediately called the members together and for the last 12 years no one could ask for a more active or valuable club. Another reason why continuous service is needed, is that up to date programs on subjects of value and importance to the membership must be furnished or the interest will lag. Long service will generally give the knowledge of what is desired by the Club. Hard working people will not attend a meeting unless it is made profitable. Our Club has done many things of which it is proud. It has produced a genuine co-operative spirit, 96 per cent of the citrus growers are Exchange members in the Eastern San Gabriel Valley; to only about 60 per cent in the state. When the Sunset Telephone Company was charging $2.50 a phone for the poorest of service and having only 400 connections, the secretary secured a lot of data about mutual telephone companies in the middle west and brought it before the Club. A committee was appointed to look into the matter, and the result was the present Pomona Valley Telephone & Telegraph Company, with some 10,000 phones at $1.00 each per month, covering Pomona, Claremont, Chino, San Dimas, La Verne, Spadra, and Walnut, giving the rancher the best of communication with his friends, business, homes, doctors, etc.

This was the first co-operative home phone in the state, and it drove out all the local Bell phones in two years. It required lots of hard work and the solid backing of a live Club to do this, but what a satisfaction! Our Club also was the initiator and with Mr. Frank L. Palmer, chairman of the committee, secured the passage of the present fertilizer law by which the Agriculturists of the state are now saving millions of dollars in the cost of the plant food he buys. Much rubbish not worth $5 a ton was being sold before this for commercial fertilizer at $35 to $50 per ton. Now you know by the analysis on each bag just what you are buying. In conjunction with the Pomona Farmers' Club the Los Angeles County Mutual Fire Insurance Company was organized with one of its members, Mr. Geo. Cromer, as Secretary and Manager, and he still holds this office. It is now insuring millions of dollars worth of property at very low rates and it is a great success. The Clubs had to have a number of laws passed and others repealed to make such an organization possible, because the exceedingly high calibre legislators(?) thought that the poor ignorant fruit grower and rancher needed to have laws to protect him from himself, for the benefit of the old line insurance companies. Our world wide celebrated good roads, no doubt are the aftermath of a lot of boosting of our Club, through its President and Secretary sixteen years ago when at every institute conducted by Dr. Cook the Secretary gave a talk on the great benefit the good roads of New Jersey were to the farmer. He being one of the State Representatives in the L. A. W. when that organization put through the pioneer New Jersey Good Roads Law. Mr. W. A. Johnstone, then a member of the club, now one of the State Water Commissioners, was just after this campaign elected to the Assembly. He co-operated with our club and secured the passage of a similar good roads law. Gov. Gage didn't sign it in the press of other bills. At the next legislature we went after it the second time. It passed again, and this time Governor Pardee was asked personally to sign it. He said it was a splendid bill but it was ahead of the times, and the people wouldn't stand for it. These campaigns, however, had their effect and we are now enjoying the best of roads. Several years ago, the club started a movement in the Claremont district to examine every citrus tree to discover just what scale insects were present. A number of the senior class of Pomona College, who were doing advanced work in entomology, were secured through Dr. Cook, and headed by E. O. Essig did a thorough job. An infestation of mealy bug on about

4 acres was found and completely exterminated after a lot of hard work and radical treatment directed by the best of experts. This action alone made this Club worth while, for absolutely no one knew of there being mealy bug in this section and it was rapidly getting so established that in another year it probably would have been impossible to eradicate it. I could continue multiplying the good things that the Club has done, but this paper would be too long. These few instances show what has been done by a live club in direct benefits but who can estimate the great help socially and educationally derived from the meetings as month by month the best talent in our business discusses with us all the new problems of the hour. If every community had such a club and all the clubs were federated how much more could be accomplished. I am happy to see that there is a movement under way to join our Farm Bureau Centers into a State Association of Farm Bureaus. If the Farm Bureau is the most likely way to unite the rancher into an organized body let's boost the Farm Bureau in all our Centers. To make this successful, you must have live enthusiastic officers who will be willing to sacrifice some of their personal interests for the public good. The programs must be made worth while, or the lukewarm indifferent members won't come out. It is one of the kinks of human nature that many people have to be pulled or pushed into their blessings. The great criticism of Pilgrim's Progress is that Pilgrim hustled to reach the Eternal City by himself, leaving his family to get over their difficulties alone with small chance to get anywhere. There are in every community, we know, big men who always give more than they receive that the general good may be advanced. It is just as true today as when the words were spoken that "It is more blessed to give than to receive." We have many examples among the California Fruit Growers. It would pay you all to investigate and get informed as to what great help you are receiving all the time from these big unselfish men. Right now a number of them in the Citrus League are fighting your battles, trying to get the outrageous increase of freight tax on citrus fruits taken off. If we had a line of live clubs or bureau centers in every community to back them up, how much it would encourage them. Just a word about the details of our club. The membership is limited to 35 families and we have from 65 to 100 present at each meeting. We have morning and afternoon sessions with a dinner at noon furnished by the hosts of the day. Each member is required to entertain the club in turn, but as it comes only once in five years, it is not a great burden. The social hour at noon is one of the great attractions. In the early summer and fall a picnic open meeting is held.

During the last few years we have heard efficiency preached so much that we are in danger of forgetting the humanitarian side of life. The average American is so busy chasing the nimble dollar that he forgets oftentimes his higher nature. Our club ever keeps this in mind, and while efficiency in making the orchard produce every dollar possible is the aim, the other side is not neglected. The meetings open with music, reading from the Bible and prayer. One paper is given for the Woman's Hour, on uplifting general topics. At our last meeting Professor Ament, of Pomona College, gave one of the most illuminating, instructive and interesting addresses on Russia that could be heard in any Chautauqua Course. We have our own dishes, silver, table cloths, chairs, etc., and use lapboard 2½ x 5 feet for tables. If any of you want to see a good live meeting and have a jolly good time let me know what you can tell us that will be beneficial and you will get a hearty invitation to bring your family and swap good things with us together. I would like to invite you all to our next meeting on Saturday to be held with Mr. John P. Englehart of Glendora, whom most of you know as the lemon pruner. The program is a simple one.

Mr. Englehart will give a pruning demonstration in his orchard. J. B. Coultson, the well known banker of Pasadena who was sent to France by the government will speak on Americans in France.

Dr. J. E. Coit, head of the Farm Bureau of Los Angeles County, will speak on "Buried Manure." Dr. C. B. Lipman of the University will be down from Berkeley to continue his address given us last year on "Some Observations on Modern Soil Chemistry."

We have yet to see a stranger go away from our meetings without expressing their interest and pleasure at what they had received. Why not try having such a club in your section?

The Chairman—The next gentleman who was to address you is Mr. Wilmon Newell, State Plant Commissioner of Florida, but Mr. Newell is not present and the Secretary will read his paper on "Citrus Canker."

(*The Secretary read Mr. Newell's paper as follows*):

CITRUS CANKER ERADICATION IN FLORIDA.

By WILMON NEWELL, Gainesville, Florida.

During the past five years the citrus growers of Florida have passed through a remarkable experience.

The growers have seen a new and very deadly disease appear, like lightning from a clear sky, have seen the disease lay waste beautiful, productive groves, have rallied all resources to battle with the foe, have seen control obtained and the enemy finally reduced to the point where it is doing no financial damage.

Eradication of citrus canker from Florida is not yet complete and the citrus industry is not yet safe from this terrible menace. However, the success that has been achieved shows beyond peradventure of a doubt that, with abundant resources, proper methods and efficient work a plant disease can be eradicated and this is, perhaps, the greatest accomplishment of all, for it will encourage the inauguration of intensive campaigns to eradicate other destructive diseases.

EARLY HISTORY.

The first case of citrus canker in Florida was found on September 30, 1912, by Dr. E. W. Berger, at that time state inspector of nurseries, in a small nursery of *Citrus trifoliata* seedlings which had been imported direct from Japan. The identity of the disease was unknown but specimens preserved by Dr. Berger were compared, months afterwards, with what came to be known as citrus canker, and were found to be identical with it.

In July, 1913, the "unknown disease" was found in a nursery in Dade County and efforts were made, by means of quarantine measures, to prevent its spread. During the spring of 1914 the infection appeared in other Dade County nurseries and in some of the adjacent groves. It was then that its extremely destructive nature was brought home to the growers. Young citrus trees, becoming infected with the disease, died in a comparatively short time. Bearing trees did not produce a single marketable crop after becoming infected.

In May, 1914, the Florida Growers and Shippers' League, a co-operative non-marketing organization, took up eradication work, supported by assessments upon its members and by donations from marketing agencies, transportation companies and others. All conceivable sprays and treatments were tried, but without success. The disease continued to spread with amazing rapidity, and in July, 1914, the conclusion was reached that nothing short of destruction of infected trees with fire could check the disease. At about the same time it was learned that whenever a man visited an infected property or an infected tree the disease appeared in every citrus property which he entered for several days afterwards. This led to the use of disinfecting measures, crude at first, but gradually developed to the point where all inspections were conducted by men attired in one-piece suits which were disinfected, along with shoes, hands, hat and face, whenever the men left the citrus property.

Midsummer of 1914 showed the disease still on the increase in Dade County despite all efforts of the Growers and Shippers' League. The citrus growers saw their investments going and then and there commenced a battle such as has probably never been witnessed in peaceful times. Property owners contributed heavily from their resources and in addition served voluntarily upon the inspection force while their wives and children did the work at home. Some even mortgaged their homes that they might contribute funds to the fight against citrus canker.

FEDERAL AND STATE AID.

The first federal assistance came in February, 1915, when Congress made a small appropriation for "investigating the possibility of eradication." Of this fund $24,000 was used in the Florida inspection and eradication work between February and June, 1915.

So serious was the situation by the spring of 1915 that the Florida legislature passed the Florida Plant Act, creating the state plant board and appropriating $125,000 for citrus canker eradication.

In June, 1915, canker was found in a large citrus nursery in northern Florida. Investigations showed that this nursery, as well as the nursery in Dade County found infected in 1914, had received citrus nursery stock from Texas in the winter of 1912–13 and that the Texas nursery supplying this stock was also infected with canker. These two nurseries, prior to the passage of the Florida Plant Act, had shipped nursery stock to all parts of Florida. Records of these shipments were obtained and it was found that a total of 3,131 shipments, containing 338,512 trees, had gone to 427 Florida towns and villages. The plant board inspectors immediately hunted up these plantings and upon first inspection 62 centers of canker infection, located in 21 counties, were brought to light!

Thus the amount of the disease present in Florida was found to be many times greater than supposed when the legislature made its appropriation of $125,000. The result was that this appropriation was practically exhaused in 10 months time. The canker eradication work would have failed at this point had not the Bureau of Plant Industry, United States Department of Agriculture, come to the rescue. From federal appropriations the bureau defrayed practically the entire cost of the eradication campaign during 1916.

The Florida legislature of 1917 made an appropriation of $300,000, and out of this fund, assisted by the Bureau of Plant Industry, the eradication work has since been carried on.

ESSENTIAL DATA.

Statistics are wearisome and our only justification for presenting a few of them lies in the fact that they "tell the story" as nothing else can. Take, for example, the number of canker-infected trees found each year. In 1915 this number was 6,715; in 1916, 2,294; in 1917, 372; in 1918, 15, and between January 1 and May 15, 1919, 2.

However, this record does not give us a true insight into the present status of canker eradication. It is necessary to consider, not the number of infected trees being found, but the status of infected properties with relation to the probability of their showing future infections.

The disease has been found in 481 citrus-growing properties in Florida. From 292 of these properties eradication is undoubtedly complete. One hundred eighty-three are still in the "dangerous" class, in that sufficient time has not yet elapsed to make sure that there is no possibility of further infections developing. Of this class it is probable that 95 per cent are safe. The remaining six properties are still classed as "actively infected"—which means, for all practical purposes, that canker infections are likely to be found in them any day. Such properties are of course under very intensive inspection, amounting practically to an inspection of every leaf on every tree at least once a week. The 183 properties are on monthly inspection and all groves and areas in which canker has ever appeared receive an inspection about once every six months.

At this time it appears somewhat doubtful whether the Florida legislature, now in session, will see fit to provide a sufficient appropriation for carrying the canker eradication work to completion in the manner deemed necessary by those in charge of the work. There are many who can not see why, with but 17 infected trees found in 17 months, there should be continued inspections upon a large scale. It may be that Florida, after all, having put the enemy to rout, will now neglect the golden opportunity to annihilate him.

Regardless of future developments, however, the fact stands out that the most malignant plant disease of all time, appearing without warning in many separated localities, was studied, checked, then controlled and finally reduced almost to the vanishing point and it is just as certain that adequate financial backing of the work for a couple of years more would insure complete eradication.

The Chairman—Professor Fawcett is the next speaker on the subject.

Professor Fawcett—I am not qualified from first-hand information to discuss this subject of citrus canker, since I left Florida one year before the citrus canker broke out, and all my information is second-hand. There are, however, in this audience several men who have had more or

less first-hand knowledge of citrus canker and of the work it does. I will serve, perhaps, in leading this discussion. Mr. Wilson, farm adviser of this county, has had some experience in Florida with citrus canker. Your secretary, Mr. Hoyt, and Mr. Hecke have, I think, had considerable experience. Mr. Hoyt went to Florida for the express purpose of studying the citrus canker situation, so I will not take very much of your time. This has been probably one of the most remarkable fights against a plant disease that has ever occurred in the history of plant quarantine work. As Professor Newell's paper points out, there were some five hundred thousand or a half million dollars spent by the state of Florida in this remarkable fight, and probably nearly as much appropriated by the federal government. One million dollars spent in fighting this plant disease! You can read between the lines of Mr. Newell's paper, I think, that he is very fearful lest after making this good fight, the people of Florida will rest easy and not support the fight long enough to finally eradicate the disease. This paper also shows to us, assuming that citrus canker would be as bad a disease in California as it is in Florida, what a tremendous fight we would have on our hands, provided the canker should become established in this state. Of course, we would profit by the experience of Florida, and the fight would not be so difficult. We would get in earlier; but it would be expensive. Let us consider for a moment and let us assume for a moment that citrus canker would not be nearly so bad in the climate of California as it is in Florida. Suppose it was only half as bad as pear blight or walnut blight. Suppose it was only half as bad as either of those two diseases—can we afford to have this thing come in? Haven't we enough things to fight at the present time? The expense of fighting a disease half as bad as pear blight in two or three years would be enormous, considering the whole state, so it is my firm belief that we should not relax one bit in any attempt possible to keep out this disease. Personally, I do not think that this disease would be as bad in the climate of California as it would in Florida, but I have no proof of this, and these diseases are not very apt to respect the opinions of people regarding them. History of insect pests in the past has shown that this has been true. Expert entomologists have predicted that a certain insect could never live in a certain section or in a certain county, but in spite of his opinion, in spite of his ideas, that insect later did enormous damage and required enormous funds in order to fight it. I would then emphasize these things that Professor Newell has brought out and make the point that we do not wish to take any chances on experimenting with this disease in this state. We had better spend a few thousand dollars in keeping it out than millions of dollars, perhaps, in fighting it after it had got in.

Mr. Le Roy—I think our quarantine service is so well established now that probably they will keep this canker out. But we have a disease in the north that is attacking the citrus groves that seems to me is something that our entire state, and especially this organization, ought to be looking after. It is not in the south yet, according to information I have received this morning, and I don't know so very much about the disease. But the farm adviser of Los Angeles County tells me that in the north it is very bad and doing great damage, although they don't seem to realize it. If Mr. Hodgson is in the room, I would like him to say a

word or two, to raise a little bit of interest in this particular disease, which is almost as bad as the canker disease of Florida.

Professor Fawcett—I was thinking while I was reading Mr. Newell's paper of the parallel which existed between the situation in Florida a few years ago and the remarks made by Mr. McBean in his talk on the war savings when he said that the United States had accomplished the impossible. When we consider that in Florida they had no organization, that they had no means to secure an organization, that they had no legal authority to carry on an eradication campaign, it seems to me that there is a great deal of credit due them. Now, I would like to hear from Mr. Hoyt, who has been in Florida and who has investigated this disease.

The Secretary (Mr. Hoyt)—When I was sent to Florida by Mr. Hecke about two years ago to make a study of the campaign against citrus canker I was greatly impressed by this same thing that Dr. Fawcett has mentioned. The thing of which the fruit growers of Florida should feel proud and the thing which should fill them with confidence for the future is the manner in which they got together and drew up a definite plan of action and then proceeded to follow that plan. Mr. Newell was, at that time, working for the United States Department of Agriculture in Texas, and they searched the country to find a man whom they believed would be competent to carry on that work. He is a man of the technical qualifications necessary. He is a man of the common sense necessary for such a task, and he possesses the executive ability to put through such a campaign, and to these things alone I attribute the success that they have attained. While I was in Florida about two years ago, I spent five weeks in going through the state with Mr. Newell visiting these various centers of infection, and at that time the success of their work had been so marked that it was evident that it would be successful, except for some unforeseen occurrence—that the time was surely only limited until they would reduce the infections to nothing, and that time has almost come, and I, anticipating such a time, asked Mr. Newell if he did not believe that the hardest time in the whole citrus canker eradication battle was yet to come when they went to the legislature to ask for funds to carry on the work, the cause of which apparently had been removed. His answer was that that was already the thing that was beginning to occupy his mind. There was no question, so long as the funds remained available, that they could eradicate citrus canker. But when it came to the time, that months passed without the finding of a single infected tree, and when it came to the time that property after property which had been kept in quarantine for a number of months, or even years, was released because there was no longer danger of infection, that then was the time that it would need all the backbone and all the support and all the enterprise of all the Florida growers to be able to prevail upon their legislature to provide funds to maintain that work.

That time evidently has come and Florida has tried rather a novel scheme, in some senses of the word, to provide funds. They submitted a bill to the legislature, providing for a tax on every box of citrus fruit which was to go to the state for this citrus canker eradication fund or for the eradication of other pests after this campaign had ended. That bill has not met with success, but there is still hope that their general appropriation bill will come through. As far as the probability of our

being injured here in California by the introduction of citrus canker, it seems to me that that is something that we can not intelligently discuss, because there is only one way that that question can be answered, and none of us are willing to pay the possible price of obtaining that information. The only information that we have is that in those localities where it has been introduced, it has been extremely deadly. As Mr. Newell has pointed out, it actually results in the death of the tree.

Mr. Rixsford—I would like to ask if any steps have been taken to eradicate the disease from Georgia and Alabama?

The Secretary—The federal government has eradicated the disease, or is eradicating it, in all the states infected on a co-operative basis, dollar for dollar with the states concerned. In Georgia, Alabama and Mississippi they have had very good success, and if it is not entirely completed, it has reached about the same stage that it has reached in Florida. In Louisiana there is a great deal of work yet to be done, and I believe that the belt of citrus trees about a mile wide which follows the Mississippi River from New Orleans to the delta, is probably going to remain the center of infection in the United States for the longest time.

However, there is great pressure being brought to bear upon the people of Louisiana to eradicate the disease in that section.

Mr. Hodgson—MR. CHAIRMAN, LADIES AND GENTLEMEN:

I am told that I am called upon to give a few remarks on the bacterial diseases of trees which have been present in California now for some six or seven years, to our knowledge, and which apparently should receive some consideration. In 1912, our attention was first called to a peculiar canker found on some citrus trees in the vicinity of Oroville, in Butte County. It was not known just what it was due to, and not very much consideration was given to it. In 1915, however, I made a visit in the Oroville section and I noticed a condition that did not seem to be due to frost, but on further examination it was connected very definitely with the presence of this canker. In the spring of 1915 we took specimens while the disease was still active and sent them to the experiment station and interested the Division of Plant Pomology, Mr. H. A. Lee, and he worked on these specimens and he isolated a bacteria which apparently is a new bacterium and which is responsible for this disease.

The disease has been studied and is found to be a serious process. Fortunately, it only works during a certain combination of climatic conditions; when late rains occur, followed by warm weather, it is active. The effects are similar to those of pear blight. Within a week it will spread like wildfire over a community and apparently follows the direction of the prevailing winds. It attacks the leaves between the point of juncture and the wings and it follows down the wood, depending on the virulence of the attack as well as upon the ripeness of the wood. It may kill it for a few inches. But this season we have found places where it killed branches back five or six feet. It results in the formation of a canker at the point where the activity ceases and the bacteria are apparently able to pass the summer and the fall in these cankers, coming out again when conditions are favorable for growth.

In 1912 the disease was found only in the Oroville section. Apparently it is endemic in that section. In 1915 it spread to Corning; in 1916 it was found about Porterville. In 1917 the disease did not seem to be

active, although it could be found. Last season it was rather serious. This season the reports are that it has been very bad indeed, and, in fact, got so bad in the Oroville section that the Farm Bureau noted it as one of their projects upon which they wished assistance from the state university. No one knows what it would do in southern California. It may be that under our climatic conditions it would work more actively than in the hot interior valleys. It is quiescent during the summer on account of the fact that it is so dry and so hot. Nothing has been done in the way of control or eradication with the exception of a certain amount of treatment similar to that given to pear blight, which consists of merely pruning out infected branches and cutting out the limbs which have the cankers on.

Mr. Le Roy—Are the pustules similar to those of the citrus canker?

Mr. Hodgson—I have had no experience with citrus canker, having merely seen illustrations. The illustrations look very similar, but they occur only on the stem about the base of shoots that have been affected, or about the base of the leaves.

Mr. Le Roy—I have seen the citrus canker on the fruit itself.

Mr. Hodgson—I have never seen the disease which has the name given to this. But there is a citrus canker and a citrus blight in Florida.

Thursday, May 29, 1919.

Afternoon Session.

Hon. G. H. Hecke, presiding.

Meeting called to order at 1.30 p.m.

Chairman Hecke—The meeting will please come to order. It is rather peculiar for a northern grower to come down here and introduce to you a man from the south—Mr. Chapman, whom you know so well, but incidentally, I have great pleasure in introducing to you Mr. Chapman, with whom most of you are well acquainted. He will preside this afternoon in my absence.

(*Mr. Chapman assumes the chair.*)

Mr. Chapman—I want to express my appreciation of this honor. I assure you that I appreciate the honor, and have watched with great interest the development of the fruit industry of California. I am interested, of course, in the citrus business. Yesterday I was considerably impressed with the marvelous strides that have been taken in the development of the citrus industry and the methods of handling and the equipment that is now provided for handling our fruit. This was impressed upon me by visiting one of the most modern packing houses, and I could not help but draw a contrast to the years gone by when we ran our little hand machines and brushed our oranges with hand brushes. Now everything is automatic, and the oranges are brought in from the orchard by trucks, and handed out in a beautiful package. I marveled at the rapidity with which they acted and with the way in which each operation was conducted.

I want to say, too, that we appreciate very much the leadership that we have had in the dozen years or more given to us by the state. We

remember Dr. Cook, and I will always remember him with a great deal of pleasure. His memory is sacred with me because he was the first one that patted me on the back and told me that I knew something about the citrus business, and made me believe it, and in his way led me up. Our present State Commissioner is doing great work and we appreciate it. It is possible for the industry to make greater strides if it is going to be a settled fact that if the Eastern consumer wants anything really delicious in the way of fruit, he must come to California for it.

And I thank you for this pleasure of presiding at this meeting this afternoon.

Mr. Chapman—I am requested to announce that the resolutions committee will meet immediately in the lobby. Any members of the committee who are present are requested to meet at once in the lobby. I am reminded that California not only grows oranges, but there are other delicious fruits that she produces and in great abundance and of the most perfect quality. We all know something about the California prune. The prune growers have been very persistent in pushing their product—and we commend them for it—until it is prunes here, prunes there and prunes everywhere. Now we have all sorts of delicious dishes with prunes. We want to hear about the prune this afternoon—"The California Prune and Apricot Growers," by Mr. Dunlap, director for San Jose.

Mr. Dunlap—MR. CHAIRMAN, LADIES AND GENTLEMEN:

It has been my part of late on numerous occasions to tell more or less of the activities of our association's efforts among the prune and apricot growers of the state and for the benefit of that industry. We have not the years of accomplishment back of us that your organized work in the south has, but we think that we have a start on which we will build in the future. Such a wonderful success as you have had here accomplished in the modern merchandising of your products. You have been more or less the inspiration to our other fruit producing industries of the north, and we have our little starts in all lines as well as prunes and apricots. Probably youngest among these starts is our Prune and Apricot Association. A report from the California prune and apricot growers would be a rather difficult task in the short space of time allotted here in this Convention. It has been more or less requested that we prepare papers for this occasion, and having met particularly with our growers in different districts of the state and discussed the matter with them for some hours on occasion, I recognize that if I were to get into the vast detail of our effort, it might be a trespass on your time. I have prepared some such a paper, a more or less digested statement. But, before coming to that, I recall a conversation I had a few days ago with a business man from the East who had some little knowledge of what producers had failed to accomplish in a co-operative way, in many of their attempts in other districts of our country. And it was certainly a marvel to me to learn of the forward strides and accomplishment of our state along those lines. He had come to consider this co-operative effort on the part of producers a matter born of adversity, that would under all circumstances die of prosperity. For the most part our co-operative efforts here have been cruelly born of adversity, of necessity. Our orchards could well, in many cases, be termed mighty expensive hog

pastures. We had to get together and make a start. We had our failures, and out of the failures we have accomplished success. As we look back over those failures, over some period of years, we think of them rather philosophically now, and we look back on them now as good investments, investments in experience out of which we have evolved some ability to make a little success for our efforts. Our Prune and Apricot Association has a little further accomplishment to recite. It can hardly be said to be born of adversity and it is a compliment to the business judgment and honesty of these growers, that we have an organization today. It was entered into as a preparedness measure. We know how the good price of potatoes one year breeds overproduction the following year. In a more or less prosperous period we developed, and are still developing, a vast acreage, and we now have our start in what is known as the California Prune and Apricot Growers, Incorporated. In order to confine myself to the high points at all, I will take up this paper.

(*Mr. Dunlap reads paper as follows*):

THE CALIFORNIA PRUNE AND APRICOT GROWERS.

By H. C. DUNLAP, San Jose, California.

RANGE OF ACTIVITY.

The California Prune and Apricot Growers, Inc., is at the present time a co-operative marketing organization, handling the dried prune and apricot products delivered by some seven thousand grower members throughout the state. It has a paid-up capitalization in excess of one million dollars subscribed by grower members. With this capitalization and contracts insuring the handling of in the neighborhood of 75 per cent of the production, we have a power capable of developing and maintaining markets; for the first time in the history of these industries a power capable of effecting a standardization of the products; sales and advertising effort impossible to individuals; and a stabilizing influence of mutual benefit to producers and consumers alike.

In the matter of standardization we have made great strides. The high quality maintained in spite of disastrous conditions surrounding production in the season of 1918 has made our Sunsweet Brand the recognized quality brand in the trade. We have accomplished more in this matter of standardization in this one year of calamity than could have been accomplished in six ordinary seasons. We have already made a start in the matter of advertising. We have our connections with brokers and sales agencies throughout the world and have our brands registered in some fourteen foreign countries.

We now own and operate some fourteen packinghouses, and we are at present negotiating for the purchase and erection of further plants, so that we will be attending our manufacturing concerns practically 100 per cent in our own plants.

We have developed our manufacturing department to attend new adventures and have made a start in the successful packing of dried fruits in cartons; also dried fruit products in glass and tin.

During the past two years we have done a business approaching a gross aggregate of $20,000,000, and this has been so attended as to establish our credit with the financial institutions of the land.

To dwell on these detailed statements of comparatively minor accomplishments would be rather uninteresting; so, for the purpose of this report would wish to make more or less a broad statement of the aims and purposes of our work.

THE ASSOCIATION IN ROLE OF GROWERS.

As growers we have thought ourselves most up to date in attention to our business concerns. We have attended horticultural conventions; we have read the "Pacific Rural Press," "The Cultivator," and other farm papers; we have attended closely the bulletins and activities of the agricultural department of the

state university, and have otherwise endeavored at all times to attend our cultural affairs according to the latest scientific developments.

In another equally important field of our endeavor we have been most unbusinesslike and truly "mossbacks"—namely, the sales end of the game. At the present time society is pleased to call attention to the progress of civilization; new and modern methods of waging war, seeking pleasure and doing business have been and are continuing to be applied to all phases of man's affairs.

While our orchards have been most certainly well attended and protected free from weeds and pests, another and a most important field of our adventure has grown to grass and speculators. No nation could wage war today with a wooden navy and flint-lock guns, and no man can entertain his fellows without some recourse to certain modern invention and pastimes, such as the automobile, the "movie," the phonograph and the like. Just so no business man can hope to maintain a profit and compete in the merchandising of his product, whether of the soil or factory, without recognizing and adopting certain essentials of modern business.

AIMS OF THE ASSOCIATION.

The California Prune and Apricot Growers, as an organization, holds forth the opportunity to individual producers to become as businesslike as their competitors in the production and sale of food products. With the present planting of prune and apricot orchards we have the certainty of double and treble the present production in the next three and six years. A survey of the methods of merchandising food products today leads all business men to conclude that no product can become a staple and command a world's market where no effort is made to invite the favorable attention of consumers. We arrive at this conclusion after a study of the grocery store around the corner. We all remember that establishment a few years ago—a collection of bins, bags, barrels and other large containers from which our requirements were dished out. In that day and generation the 50 and 25 pound boxes of dried fruit could sit up on the counter and compete most favorably with the barrel of rolled oats for a place on the breakfast table of the land.

Visiting that same grocery store today we find a revolution—tier on tier of shelves covered and lined with advertised branded package goods—the result of a modern effort on the part of food producers and manufacturers. And what of the prune and apricot? If there at all, they are down behind the counter or out in the back room in the old 50 and 25 pound boxes gathering dirt and dust and flies, gouged out with a dirty scoop or worse—most undesirable to the dealer to handle and to the consumer to purchase. Previous to the formation of our organizations we modern, up-to-date horticulturists were most truly "mossbacks."

TRUE VALUE OF JUDICIOUS ADVERTISING.

On the foundation of considerable trade advertising now well in hand, our California Prune and Apricot Growers will this fall put on for a starter its first true consumer advertising effort. With a proper sales and advertising effort we anticipate making our prune products the most staple fruit food in the world—cured, canned or fresh. And we similarly anticipate developing our apricot product until it is recognized as a delicacy among dried fruits. We have no fears regarding our ability to accomplish these results with the food values we have to offer, when we contemplate the excellent business that has developed from the advertising and sale of breakfast cereals and other toasted sawdust and food substitute products.

DEMAND AND SUPPLY.

During the war period now past, demands out of all proportion to supply in some instances developed a profitable production of bulk commodities, but if any of these profitable industries are to maintain they must compete, not in price, for the competition of price is ruinous, but in quality and service, for these are the elements of successful modern competition. According as our growers in the different producing industries of the state recognize these facts and stand behind the organized merchandising endeavors now in progress, they will maintain in the profitable operation of their properties so long as food producers anywhere maintain for themselves such return.

OPERATIONS IN NINETEEN HUNDRED SEVENTEEN AND NINETEEN HUNDRED EIGHTEEN.

In our California Prune and Apricot Growers our operations during the seasons of 1917 and 1918 have been surrounded with most abnormal and, in many ways, difficult conditions. Previous to the season of 1917, in the neighborhood of 70 per cent of our dried apricot and 50 per cent of our dried prune products went to a certain export market. During the two years of our country's participation in the war we were cut off from these markets and we were especially sufferers from this condition. In the season of 1917, in the face of positively the largest dried fruit crops in the history of the different cured fruit industries of the state, we feel fortunate in having even over an extended period completed the marketing of that crop.

Our membership has to date borne the greatest burdens that will ever attend the support of our efforts, and we now offer to the industry and growers not so far listed with us, an organization commercially sound with valuable experience bought and paid for. Some people are marveling today at the continued increase in the value of many commodities. They have considered war prices a product purely wartime, and fail to understand continued advance in values as a result of business conditions now maintaining.

In our prune and apricot industries we did not so particularly enjoy war prices during the war in that we did not have the conditions bringing about such results. Briefly, war prices are the result of a demand increased out of all proportion to supply, whereas, due to a loss of export and bumper crops—especially in the season of 1917—we had in our industries a demand decreased out of all proportion to an extraordinary supply. The rocks on which our enterprise might well have foundered, making good the fears of growers recalling failures of the past, are now passed and a matter of history.

FUTURE PROGRESS.

We certainly look forward to a most prosperous year to the producers of prunes and apricots. In other words, the members of the Association as pioneers have established new frontiers, and it is the duty of every prune and apricot grower to assist in maintaining and developing the new field of activity and profit now open to all. The fundamentals underlying our work are axiomatic and, having demonstrated the particular application of them to our industries, we look forward to reporting in the future continued and greater success.

Mr. Dunlap—Another little matter that comes to mind along that line: we were holding a little meeting among our growers in Visalia, and we were telling of this advertising campaign that we planned for this fall, dealing with the different features of it, particularly with the educational feature, and I found that 90 per cent of the members' wives did not even know how to stew a prune properly, and we thought as a result of the little occurrence at that meeting that they certainly did need education in the preparation of our prune products. One of the growers brought in a letter from his wife's sister in Texas. He had sent a twenty-five pound box of prunes. "The prunes arrived in fine shape and they are mighty nice to eat, but they don't fry very well."

The Chairman—We regret to say that the California Pear Growers' Association will not be discussed, but Senator Cogswell is requested to discuss a problem at this time.

Senator Cogswell—MR. CHAIRMAN AND MEMBERS OF THE CONVENTION:

When Dean Hunt informed me at lunch today that it would devolve upon me to represent him this afternoon in his place of representing Dr. Elwood Mead, who was upon this program to speak upon the question of the State Land Settlement Colony, I felt somewhat like the friends of the old hunter who, having shot a gazelle, made a present of it to the

duke of his district. Some time afterward, going by that way, he called at the door of the ducal mansion and said he was the man who had sent the duke the gazelle. He was invited in to dinner. Some time afterward another man came and said he was a neighbor of the man who had sent the duke the gazelle, and he was also invited in to dinner. Afterward a third individual came to the door and announced that he was a neighbor of the neighbor of the man who gave the duke the gazelle, and the duke gave him a glass of cold water, and said, "Friend, drink of the broth, of the broth, of the gazelle." I feel that is about what the Convention will have today. It will be the "broth of the broth of the gazelle," so far as an account of the State Land Settlement Board is concerned, because I have neither facts nor figures except what I brought along in my mind, having no idea of being on the program.

The State Land Settlement Board was a board appointed two years ago by the governor to carry out the plan of the act of the legislature of 1917, providing for the purchase and subdivision and settlement of large unimproved tracts of land in the State of California, $260,000 being appropriated by the legislature for the purpose. With that we purchased in Butte County, the Durham Ranch and the Lot Ranch of about 6,400 acres with Butte Creek flowing through the property. A great portion of the land had never been used except for gain or for pasture. We obtained possession of about 3,400 acres of this in March last, a year ago, and we subdivided and sold that portion. Our plan was as follows: First we advertised for a tract of land which we might purchase. Some forty-odd tracts running from five to ten thousand acres were submitted. The Department of Agriculture, Dean Hunt and the soil analyst, Dr. Shaw, made an examintion of the land as to its practicability for the uses we wanted it for. The State Water Commission passed on the water rights. Finally some forty tracts were narrowed down to three, so we made our first selection of the colony tract. We started in then to prepare that for settlement. We put about 900 acres of it into alfalfa last spring. An irrigation system was installed. A concrete dam was put across Butte Creek, with a diverting rear, and supplies water to irrigate the entire tract with an abundance of water. That being done, we advertised the land ready for settlement, and upon the day upon which we were to sell, we had about nine or ten applicants for each tract of land in that colony. We made our selection of the candidates as they filled out their application blanks, stating their experience, stating what their capital was, their age, and their families, etc., and then by a personal examination of the applicant, selected the families who, it seemed, would be the most likely to make a success of farming in that locality, and the entire tract was allotted and disposed of, and the following tract which we obtained possession of in September was all sold about Christmas. So that the first land colony has become a fact. We have some eighty families living on that tract of land which had heretofore been ranged to sheep, and some dry farming. We provided that the State Architect should furnish plans of a number of styles of up-to-date bungalows and the houses are put upon the land according to the selection of the purchaser. The purchaser pays down 5 per cent of the cost of the land and 40 per cent of the cost of the improvements, and the remaining portion is amortized in twenty-year payments. Enough was set aside in the selling price, which was ranging from $100 per acre up to $225 an acre, for an

exceptionally well located tract which had been in alfalfa for two years—enough was added to the price to bring it up to that amount to provide for any possible loss that might occur in the future. The state will receive back the entire $260,000 which they appropriated and 5 per cent interest upon the money, from the time the state appropriated till it is returned to them. There will be a margin to the state of a profit probably fifteen or twenty thousands over and above that after the entire business is closed out. So this colonization scheme will cost the state nothing ultimately but the loan of the money. The last legislature has appropriated $1,000,000 for the same purpose and there will be, without doubt, at the next election, a bond issue of $10,000,000 to supplement that, and it will all be expended under the same terms and conditions. In other words, every dollar of the money will return to the state with interest from the time it is appropriated, or the bonds sold, until the entire sum of money is returned to the state. It is not a charitable institution by any means and not intended that way, but to bring into settlement lands which are not settled to private homes, for more people in California and to produce more food and to provide more income producing property in the State of California. The cost to the taxpayers will be absolutely nothing. The entire overhead cost, so far as I remember, is concerned with that 6,400 acres after it had been developed and eighty families put on it, was less than one-tenth of the average selling price commission paid to the real estate broker. That, of course, did not include the salary of the superintendent. It is a charge upon the property as long as he remains there.

We provided that only one kind of hog and one kind of cattle should be raised on the land. The farmers were to meet and decide what variety that should be, the object being that they should have the very best improved stock that was to be had. If there were ten or fifteen breeds of hogs and five or ten different breeds of cattle, they could not afford to import the best breeding stock. But as long as the entire tract was to have one breed of stock, the best breeding stock obtainable in the United States should be at their disposal; and that is the way it is working out.

We propose, as soon as this next appropriation is available, to ask again for the submission of tracts of land of from five to fifteen thousand acres. As soon as that is obtained and under way, to proceed with another upon the same plan. And so far as the finances are concerned, it is simply a revolving fund. The deal is financed by the state land bank, and the entire cost to the purchasers is 5 per cent interest upon the money and twenty years amortizing payments on it. That, I think, covers what the State Land Settlement Board has done, and is trying to do.

The Chairman—That surely is very interesting and a very practical enterprise for our state to engage in.

We will hear Mr. Wilson of the California Fruit Growers' Association. He is not present, but Mr. Sunderland will take his place.

Mr. Sunderland of Fresno—I regret very much that Mr. Wilson was not able to be present, but he had a call north at the last moment so that he could not possibly be in two places at once, and consequently he has asked that a substitute be furnished.

(*Mr. Sunderland reads as follows*):

CO-OPERATIVE MARKETING.

By AL. SUNDERLAND, Fresno, California.

Co-operative marketing—that is something that now during the past few years everybody is becoming to feel and acknowledge to himself is here to stay. California certainly leads in the co-operative marketing spirit. I was in the commercial packing business for sixteen years prior to the organization of the California Peach Growers. So with that kind of an organization I have been since, and I am almost as enthusiastic over co-operative organization as Colonel Weinstock, and you know that is some enthusiasm. If you are as enthusiastic as he or even my friend Mr. Dunlap, after the reading of that excellent paper by Mr. Dunlap, I don't think there is any further enlightenment that I could give you people. He has covered the ground most fully. The prune, of course, and the apricot is the thing he is interested in. The prune is probably not so hard to talk about, because that has been with us forever, even as long as the boarding-house hash, so, I think it is a thing easier to talk on than the dried peach. The cheapest article of all dried fruit for years past has been the old dry-looking, fuzzy, coarse skinned peach. It has been passed by like a white chip, even by cheap boarding houses. Now, it has been our problem to so put that peach before the people—to so educate and instruct the growers to put up a better article of dried peaches, that it might be placed before the public, and in time we hope will be classed as a common every-day fruit, the same as the prune. We believe that we are on the right track. We have been organized three years and each year is producing better results along the lines of co-operation from the growers' standpoint. The growers each year are endeavoring to put up a better article. We went so far as to produce two rows, two thousand feet of film for moving pictures of the peach industry from the time the hole is dug until the fruit is in the hands of the consumer, and the last of the second row shows the peach being cooked in an up-to-date kitchen, and in that way we have covered every phase of the dried peach from the production end to the marketing and consumption. Those films are very instructive. Of course, it may seem to the growers rather a startling thing for people to come out of an office and say, "What do those fellows know about it, sitting in an easy chair in the office? How can they tell us how to raise peaches or prunes or apricots? We have been at it for twenty years and we ought to know how." It is true they ought to know how; and they do know how to knock them off of the tree and pick them up from the dirt and sand and haul them to the packing houses. Everybody knows how to do that. But that is not going to stabilize the dried peach or any other form of dried fruit. It has got to be handled just the same as anything else. It has got to have time and attention given to it, if the grower hopes to make a success out of it. It is with those things in view that we got up this moving picture of the industry, and we took a year to produce that. We took the pictures at each stage all the way through and we have been showing it in various districts for the past two months, and it has been enthusiastically received by the growers themselves. Of

course, we expect some criticisms, but as long as the criticism is upbuilding, so much the better for the organization and so much the better for the industry and for co-operative plans in general, because it allows us to correct whatever faults may seem to be there, and whatever ought not to be there we can take out. It is easy enough to take out a piece of film and substitute something else, and sew the thing together or go ahead without anything else, but that is one of the best ways of constructive education along those lines that we have yet struck upon. A moving picture of anything impresses anybody more convincingly and they remember it longer than all the talking you can do in two hours.

By reason of co-operation the California Peach Growers felt that had it not been for this organization coming into existence the dried peach never would have had the opportunity of becoming something in the dried fruit family. We have a peeling process, an invention under the control of our organization, and that invention I do not believe I exaggerate a bit when I say by means of it, two years hence there will be no unpeeled peaches of the type shipped East or to Europe for consumption. There is no comparison between this peeled peach—100 per cent even is taken off, but there is no comparison between that and the old style peach, and that alone is going to put the dried peach on the market, and California as a state has no competitors. It is going to build up the dried peach industry in the State of California to many, many times its present size. The largest crop of dried peaches produced in this state was in 1917—forty thousand tons; last year only half of that. This year the prospects are for fully as large a crop as in 1917. I regard the advent of the Peach Growers' Association as timely—for before the advent of the Peach Growers' Association, before the co-operative methods were installed, a crop of forty thousand tons of dried peaches would have scared everybody pretty near into a fit, because in the old days, in the old style of marketing through the commercial packers, it would be positively out of question to market a crop of dried peaches of that size. There is no trouble at all now with a crop twice the size. It could be marketed.

Mr. Dunlap brought out a point and that was the advertising feature which their association is going to launch this year. We did that all last year. We advertised the Blue Ribbon package of practically peeled peaches, in the magazines, and to show you that advertising must pay and does pay and we are satisfied of it, and we are satisfied that the prune growers will also be satisfied when they try it out—this year we opened the price of peaches, the Blue Ribbon practically peeled in the carton, and within six days after the prices were named to the trade, we had to withdraw it as we had sold and oversold our physical packing capacity in cartons—seven thousand tons were sold in less than six days, of what has always been a despised fruit, as I said before, and in practically an unknown package.

Practically peeled in Blue Ribbon cartons. That shows that advertising pays even for co-operative selling associations. In order that you may have an idea of what difference there is between the old style peach as it has always been presented to the trade and the "practically peeled peach," I brought along some samples of them which give you a practical demonstration, and before I go any further, we are always endeavoring to educate the growers to the necessity of properly curing

and packing their peaches when they are ripe. Don't try to pick them all at once, but go through the orchard several times. Pick them and do not shake them off. If you have immature peaches they run into slabs and stuff of that kind. Now, here is a sample of peeled peach. Those three rows are a newer peach and were prepared, cured and ripened before picking, and it makes a very attractive piece of dried fruit. Here is the same peach, but not properly ripened and not properly cured. Consequently it won't peel as well as this, and not nearly as attractive a piece of food product. Those things are what we use in talking to growers. We give them practical demonstrations. You may stand and talk for hours and still each grower thinks he knows how to put this fruit up properly, and you can't blame them for thinking that. But if you show him what it actually means as those samples will show, it impresses him very much. There is a sample of well-peeled, properly-cured, picked-when-it-should-be-picked, and that is the kind of peach we are now putting on the market, and that is what is going to make, within two years, all the dried peaches in California to be marketed in that manner, because there is no question about the looks, the food value and everything else that goes with it. Those are not picked samples. They are taken right from our regular pack of peeled peaches.

As I said before, there is no question in anybody's mind now that co-operative association in California is bound to succeed. There is nothing to stop it. The growers have gotten to a point where they feel that in unity there is strength. They are going to see that they are not so jealous of their neighbors, and that they are not so jealous of each other. In the old competitive days of buying, it was natural for me if I sold my crop to a packer for half a cent less than Mr. Dunlap, my next door neighbor, sold a few days after, it made me a little peeved, and I would rather have a right to be. And the next year things would go from bad to worse. But there is no reason for that in a co-operative proposition, where they are all working together for one end.

I might just mention the three years we have been in existence. We were organized in January, 1916. The 1915 crop of dried peaches, the maximum price was 3 cents a pound. When we began in the spring of 1916, we took over a pool of peaches, something like fifteen hundred tons that they could not sell at 2½ cents. We took that tonnage and netted the growers that owned those peaches 5¼ cents. The 1916 crop being the first one that we actually handled as the California Peach Growers, we netted the growers 6 cents a pound. The 1917 crop we netted the growers 8.32 cents. The 1918 crop, we netted the growers an average of 11 cents. That, you may say, is war conditions and one thing or another with it. But co-operation had more to do with it than all the other things put together. Co-operative marketing associations, such as ours, and the California Raisin Association and many others, those are the things that are making such prices to the grower possible.

Just stabilizing the product and putting it on a basis where the jobber in the East is not afraid to buy—he knows if he buys a car of peaches today, that next week his competitor next door is not going to buy a car at a half a cent less. The consequence is he trains his salesmen to work on the commodity. Any jobber or any man of us will naturally work harder on the thing that we think we are going to make the most money out of, and we are going to leave alone those things that seem not to

show a profit, and that was the case in the old speculative days. Dried peaches, raisins, apricots and prunes were left alone much more than they should have been by the jobbers because there never was the sure stable profit in it like there was in the other things that my friend referred to. Those things were always a sure profit. The jobber knew when he bought a case of cereal, exactly what he was going to make. When he bought a case of peaches or prunes, he did not know. But under the co-operative method of marketing he knows he can not lose. The price is guaranteed to a certain time and he works on the commodity. We get distribution because of the co-operative organization. It was never possible to get that same kind of distribution before. The California Raisin Association is a bright, shining example of what a co-operative marketing association can do. They have been in existence six years and see what they are doing. There is no limit to it. There is no halt to it. The word "halt" made me think of the colored boy that was in the army right after the armistice was signed. Everybody, naturally, here on this side who had not gone over lost heart, got nervous and wanted to go home, and as a consequence they were all asking for furloughs. They kept coming so fast for two or three days that it would not have been more than a week when there would not have been any soldiers left in camp, and they had to sit down on it; and a young colored fellow wanted to see the bright lights of New York before he went South. He walked up to the captain and said, "Captain, I would like to get a furlough." The captain was so thoroughly disgusted with these fellows that he did not speak. He just looked at him and finally he said, "About face. Forward march!" The boy had to obey instructions. Two days afterwards the same captain got a telegram from New York City reading: "Command obeyed. Wire when to halt." It does not matter how much they wire when to halt. The co-operative selling organizations are not going to halt. This speaks louder than words what co-operative selling has accomplished. There is the peeled ripened peach. That is our brand. The peach last year produced a total of $4,537,874.50, that is 100 per cent of the sales. Where did it go? Return to growers, $3,354,405.94 or about 74 per cent—three-fourths of all the money received for the dried peaches. In our association last year that was returned back to the growers. The balance of it went for packing material, 3.34 per cent; manufacturing cost, 2.01 per cent; labor cost, 3.15 per cent; general expense, including the concentration of peaches all over the state, adding taxes and losses, 4.47 per cent; selling expense, including cash discounts, brokerage, etc., 6.21 per cent. That is the entire expense of selling through the brokers and the cash discount. Field expense, men going around visiting the fields, .22 per cent; interest, 1 per cent; insurance, .66 per cent; depreciation, 1.02 per cent; reserved for taxes, .44 per cent; compensation, 2.7 per cent; that is the three-eighths allowed by the growers' contract, which is set aside to this organization for the purpose of running the organization. It pays all the salaries, office expense, stationery, telephones and everything. But, as I say, I don't know of anything that speaks in a louder voice of the success of co-operative selling plans than does that little picture right there. It speaks louder than any words that I might utter, and I am quite pleased to have the opportunity of being present here today to present these few

facts and figures, because they are facts for your consideration, and I hope that some time in the future I may have a similar opportunity to meet with such a high class of men.

The Chairman—The Alfalfa Growers of California are next in order. I will call upon Mr. Lytle.

George I. Lytle—MR. CHAIRMAN, LADIES AND GENTLEMEN:

I don't know that an alfalfa grower can get your immediate attention, especially those who are still looking at those fine specimens of fruit. But the alfalfa growers are glad to join the family of co-operative organizations. We are, I believe, the youngest of the state-wide co-operative organizations, and unless some of the older ones keep on and continue their growth, the situation may be the same as it was with the farmer that had two pigs. This particular farmer was a Hollander, and he was doing his bit to produce as the farmer should, but he had not mastered the English language. A buyer came his way one day and he took him out to show him a couple of pigs that he thought were ready for market, and the wife went along, as is quite customary with foreigners. Their wives take quite as much interest in the production and marketing as the man of the house. The farmer wanted to tell the buyer that the younger one of the two pigs had grown faster than the older and was larger. So he said to him, "You see them pigs? The youngest one is the oldest." The wife said: "He don't talk good English. He means the littlest am the biggest." So we will say to some of the older organizations, "Watch out a little, or the littlest will be the biggest." We hope to grow and we hope the others will grow also. I am pleased to have this opportunity to tell you something of the work of Alfalfa Growers of California, Incorporated.

(*Mr. Lytle reads paper as follows*):

ALFALFA GROWERS OF CALIFORNIA.

By G. I. LYTLE, Perris, California.

ALFALFA AS HUMAN FOOD.

After a little more than a year of co-operative marketing the Alfalfa Growers of California (Inc.) are now doing a business that in quantity will compare favorably with that of many of the older co-operative organizations of the state, and we expect to improve the quality so that you will all be clamoring for alfalfa for breakfast. We confidently expect to produce the best breakfast food on earth. It may be in the form of a crisp package food, or it may be in the form of milk and cream. We claim these also as alfalfa products, and we are not very particular in which form the people use our products. In fact we are inclined to believe that their use in the form of milk and cream will require larger quantities than its direct use, for some time to come at least. But we are very confident that the very best food for the race would be a crisp alfalfa breakfast food with plenty of milk and cream over it. I was formerly in the orange and lemon business, and I was then sure that oranges and lemons were the best human food.

ORIGIN OF THE ASSOCIATION.

The present Alfalfa Growers Association was not without forerunners. During recent years there have been a number of local organizations of the alfalfa growers in various districts. Among these were the Hanford and the Chino Alfalfa Growers Associations. These had the experience and history of the first co-operative efforts in nearly every line of production. By reason of lack of

capital, or a loose marketing agreement, or by reason of mistakes in management they did not survive the severe test to which every co-operative marketing organization is put sooner or later. The individual growers, as a rule, expect an organization to which they have given very little capital to solve their difficulties and establish itself in the face of every handicap and obstacle. A maximum of results at a minimum of cost is the aim of every co-operative effort, but it can not be realized at the outset.

The organizers of the present Alfalfa Growers Association, the Alfalfa Growers of California, Incorporated, profited by the experience of their predecessors. In the matter of working capital and marketing agreement some progress was made, but a larger working capital would have made the progress of the Association much more rapid.

DEVELOPMENT OF THE ASSOCIATION.

The development has been steady and the Association has taken on additional strength at every stage. To review the steps leading up to our present organization, it is not necessary to go back more than two years. Soon after the opening of the alfalfa season two years ago I was asked by a neighbor to attend a meeting of the alfalfa growers of the Riverside district. I asked if they had an organization. He replied that they had not; that they were simply meeting as growers to exchange experiences and acquaint themselves with general market conditions. A short time previous to the first meeting which I attended these growers had assessed themselves a few cents per acre to raise a fund to send two of their number to the San Joaquin Valley to investigate crop conditions and marketing possibilities.

Later in the season the growers employed a secretary and began marketing as an organization, although not incorporated. The progress of the work showed that it would be necessary to incorporate in order to bond their employees, as well as for many other reasons. A canvass to interest other growers in this district was started with the result that 183 growers representing about 5,000 acres united with the Association. Incorporation was effected in April, 1918, only a little over a year ago and offices opened on West Ninth Street, in this city (Riverside). Our capital was very limited as the growers were asked to subscribe only 50 cents an acre and of this only 10 cents an acre was paid in cash. But with more confidence than capital we entered the field and during the next few months marketed about 1,000 cars of alfalfa.

Shortly after our organization and incorporation the State Market Director became interested in our work and asked that representatives from the Association meet with the growers from other districts with a view to effecting a state organization. During the summer a canvass of the growers in most of the alfalfa-growing districts of the state was made with the result that in October the State Association was incorporated with 740 members representing about 27,000 acres of alfalfa. Active marketing by the State Association was begun December 1 and in the six months that have followed the Association has sold about 1,700 carloads of alfalfa. Of this amount the Association has placed about 200 cars in markets outside the state.

We now have over 1,300 members, representing about 50,000 acres. From about one-half of this acreage the product is marketed and from the other half the product is fed on the ranches where produced. Of the market acreage of the state, approximately one-half is now in the Association, and additional acreage is being subscribed at the rate of about 2,000 acres a month.

We now have a supply department which is able to save the growers a very considerable amount each month in the purchase of supplies. Our business in this line has not as yet attained the proportions of the business of the Fruit Growers Supply Company, but we are confident that some day it may. We are glad to have their fine record to emulate.

CO-OPERATIVE SERVICE.

Our aim is to be of service to our members wherever possible and we are preparing to handle the other products of our members in those lines where there is no co-operative organization in the field to handle them.

Many of the alfalfa growers in some parts of the state raise considerable quantities of milo maize and are desirous that our association market this for them.

We are devoting considerable time to finding new markets for alfalfa, especially in the form of meal. With the return of pre-war conditions in the shipping world we confidently expect to be able to place our products in many foreign markets.

The rail haul to tidewater from most of the alfalfa producing sections of the state is short. On board ship these products can be delivered in many foreign markets for less than the freight from the middle states to the Atlantic seaboard. This gives us both the Atlantic coast and many foreign markets, or practically a world market for our products.

MARKETING.

These are some of the possibilities of co-operative marketing. It is impossible for the individual producer to seek out these markets and it would be impossible for him to supply them when found. The purpose of co-operation among producers is to establish a system by which their products can be handled economically and offered to every possible purchaser wherever located.

The system of individual marketing is wasteful of the time and energy of the producer and is unsatisfactory to the purchaser as he is unable to get the product in the quantity, or in the form, or at the time he desires it.

We believe production in every line should be encouraged and increased. It is by production and not by a belabored system of distribution that the wealth of the world is increased.

We need both quantity and variety in production to meet the needs of the world, but the products of the individual producers should flow together and their distribution should be handled under one direction, as the product of one. Co-operative distribution alone can lay out a direct route from the producer to the consumer, giving system and directness to the movement of all produce, eliminating unnecessary handling and delays.

Under our present competitive system of distribution the labor of two people is required where one could perform the work under a proper system. The cost of the labor of two people is therefore standing between the producer and the consumer.

A statistician recently observed that a city in the middle west had about double the population that it had two decades ago but that it had only about one-half the number of stores. An investigation showed that the wants of the people were better supplied with the fewer stores than they were when they had many, which were necessarily small and with incomplete stocks. Is not this significant? Does it not suggest a better than our old competitive system of distribution? Is it a competitive and necessarily incomplete system of distribution that we wish? Or do we wish a system that will be at the same time direct and complete?

By co-operation among the producers we can eventually secure economy and efficiency in distribution.

Without co-operation among the producers the greatest men of affairs can not give us system and economy in distribution.

The Chairman—We have heard a good deal about this co-operative marketing of our products. I don't know that I ever was at a convention where it seemed to be the keynote as it is here. We will have the pleasure of listening to one who has given this great question a study that few of us have ever had the opportunity to give it. I have great pleasure in presenting to you Colonel Weinstock, State Market Director.

Colonel Weinstock—It is very kind of your chairman to say such pleasant things about me and I appreciate them, and I should be very glad indeed to believe that I deserved them. But I hope you don't think I coached him to say those things about me, because that sometimes is a pretty risky thing to do. My old friend Jacob Riis of New York, who was said to be New York's most useful citizen, according to Roosevelt, told this story at his own expense: On his way up to the platform, one of the committeemen said, "Mr. Riis, I am to present you to the audience. What shall I say about you?" "Oh," said Mr. Riis, "say anything; say

that I am the most distinguished man in America." Imagine Mr. Riis' embarrassment when the man said: "I don't know much about the man who is to talk tonight, but he assures me he is the most distinguished man in America." Some years ago there was a municipal campaign going on in San Francisco, and one of the campaigners of one of the candidates, a labor man, who was also a labor man and who had one of the municipal departments, a great aggressive Irishman. One night he was holding a campaign before the labor council. In the course of his remarks he said: "You know, boys, we public officials, we don't count for much. You fellows, the rank and file, are the real thing. You know, you rank and file may be likened to the tree, and we public officials are nothing more than the branches." There came a voice in the rear of the hall: "Yes, Mike, but all the plums are on the branches." Now, very much in the same spirit, I might say to the public official that I hope my friend Mr. Hecke has found a good many more branches than I have found on mine. I was just thinking the other night that some day in the distant future when some of my children's children will pick up one of my scrap-books and look it over with mingled feelings—on one side of the page of the scrap-book they will be reading all the beautiful things that have been said about their forbear by farmers' organizations and by chairmen of horticultural conventions, and they will begin to get pretty chesty and feel rather proud of bearing the name of Weinstock, till they read the other side of the page, and then they will feel like hiding their heads in shame because they will find that in his time there were those who denounced him as being a lawbreaker, going about his state and organizing the farmers of the state into a food trust, to sting the consumers and to exploit them for the benefit of the greedy and voracious farmer. That these charges that I am quoting are not fanciful but are real, and are matters of record, can be emphasized by reading to you some of the utterances that were published by a very distinguished fellow citizen of yours, known as Senator William E. Brown of Los Angeles. He possesses rare qualities in securing free publicity, and he has plastered the state from one end to the other, especially during the recent legislative session, with a view of poisoning the public mind against the various associations whose representatives were here today and last night, and who told you of the remarkable achievements that have been brought about by these organizations, not only for the good of the producer, but for the good of the consumer as well. Let me quote from that distinguished statesman literally. He said: "These co-operative marketing associations are against the interests of both the producer and the consumer, because they add another middleman." Referring to the poultry producers, as a type of co-operative associations of California, he published a statement that the poultry producers' association stung the producer and robbed the consumer. Again he said: "The present method established by the State Market Director in forming numerous food selling combinations will not lower the cost of living, but will increase it. Such methods are archaic, unscientific, and uneconomic." Will my friend Mr. Powell, who is regarded as one of the greatest scientific marketers in the world, and my friends who talked to you today on the results of co-operative marketing, please put that in their pipes and smoke it—that their methods are archaic, unscientific and uneconomic.

Again the statement was published broadcast, issued by this distinguished statesman, who said: "I contend that organizations of that sort are a combination in restraint of trade, and it is no business for the State of California to engage in. The State Market Director has deliberately entered into a combination which seeks to restrain competition." I have only one regret at this gathering, and that regret is that this wonderful mind who gave utterance to these sentiments is not here, was not here yesterday and today, and that his sympathizers and those whom he has led to feel as he feels about your organization, likewise were not here to hear the stories you and I have listened to, today and yesterday. It is not a difficult thing to go out and poison the public mind against any one of these associations which have accomplished this wonderful work. The method is very simple—not at all difficult. For example, I have heard my distinguished friend and fellow citizen, Senator Brown, say to a group of consumers: "What is the State Market Director doing? He is simply going up and down the State of California organizing the farmers, for what purpose—isn't it in order that they shall get better prices for their product?" The answer naturally is yes; that is one of the prime purposes. And then he would go on and say, perhaps not in those precise words—"Who are going to pay those higher prices to the farmer? Are not you going to pay them as a consumer? Ain't I going to pay them as a consumer? Are not the rest of us going to pay them as the rest of the consumers? Yes, I guess that is right. There you are. There you are. It is all the State Market Director's doings, simply helping to filch the dollars out of our pockets as consumers, and dropping those dollars into the greedy pockets of the farmers. That is all he is doing and he ought to be in jail. Boiling oil is none too good for him."

So now, on the face of things that reasoning sounds very plausible until you come to analyze it and know the underlying principles involved in proper marketing and then you discover that there is no farmer living and there is no group of farmers living that can lift arbitrarily the price of their product and that there is only one law that determines the value of their product, and that is the law of supply and demand. That it is just as impossible for you alfalfa growers, or prune growers, or you raisin growers, or orange growers to fix a price absolutely regardless of the supply and regardless of the demand and continue to get that price, as it would be for you to lift yourselves by the bootstraps.

Let me illustrate that. Let us imagine, for example, that this group within the sound of my voice controlled every egg in the State of California, and let us imagine that you said among yourselves, "Well, now, we are in the saddle. We control every egg produced in the State of California. Here is our golden opportunity to get rich quick. We are in a position to dictate prices. Let us do it. A dollar a dozen for eggs. Take them or leave them." What would follow? Two things would inevitably follow. In the first place, if you insisted upon the price of a dollar a dozen for eggs you would cut consumption into a fraction of its present volume, because untold numbers of people could not afford to pay a dollar a dozen for eggs and they would go without them. What would happen? Just as soon as the news would be flashed across the continent that eggs were being quoted at a dollar a dozen in the State of California, carloads of eggs from every state in the union that had a surplus would immediately be shipped into the State of California, and

the first thing you would know, we would be simply smothered in eggs. There would be a terrific crash and tens of thousands of dollars would be lost on eggs, and the producer here would only get back a fraction of his cost. This is not a fanciful picture. This is actually what happened not so very long ago. Only the situation was reversed. Eggs were quoted in the New York market at 15 cents a dozen higher than the California quotations. What took place? Immediately the California poultry producers began shipping carloads of eggs as speedily as they could to the New York market. Why? Because that difference of 15 cents permitted them to pay the 9 cents a dozen cost of transportation and gave them 6 cents a dozen more than they could get in the home market. The result was that New York was snowed under with eggs, and the unprecedented thing happened of the market price of eggs dropping 25 cents a dozen in the New York market within two days, and tens of thousands of dollars were lost by the operators and poultry producers who shipped to that market.

Well, the question may arise, if it is a fact then that the producers' organizations even when they are strongly organized can not arbitrarily lift the price of their product, what is the good of organizing? What can they hope to accomplish by organizing? The good of organizing, my friends, lies in this: more than the value of their product as determined by the law of supply and demand, they can not get, but what they can get through organization, is every penny they are entitled to on the price established by the law of supply and demand. Through organization they can get the largest share of the consumer's dollar in place of getting the smallest share of the consumer's dollar. Let me give you another concrete illustration to emphasize that. Theoretically, in normal times, the wheat grower, for example, is presumed to get the Liverpool price of wheat, less the cost of transportation from Liverpool to his farm. You ask, "Why should Liverpool fix the price?" The answer is that because in normal times, Great Britain is the smallest producer and the largest consumer of wheat. Liverpool being the central shipping point, becomes the world's market. When there is a superabundance of wheat available for Liverpool, the price is low; and when there is a scarcity of wheat available in Liverpool, the price is high. And the Liverpool price fixes the world price for wheat. Theoretically, the American farmer was presumed to get the Liverpool price minus the cost of transportation from Liverpool to his home. But what was the fact? The fact was that he got the Liverpool price all right, less the cost of transportation from Liverpool to his farm, less innumerable rake-offs on the part of the manipulators and speculative buyers, who got the cream, and the farmer got the skimmed milk to such a degree that the farmers in the Middle West realized that unless there was some radical action taken on their part, that industry was likely to become unprofitable. They appreciated, as you California producers appreciate, that individually they were utterly helpless; that their only hope lay in collective action. They erected their own elevators; they established their own distributing machinery; and then and only then did they really receive every penny of the value of their wheat. Only then did they receive the Liverpool price less the cost of transportation from Liverpool to their homes. You heard Mr. Sunderland of the Peach Growers tell you the story of the peach industry and the result of organization on the part of peach

growers. Let me supplement his story by my own experience. I was in New York in December, 1918, and had a survey made of the retail grocery shops to ascertain what the retail prices were of California products. Among other things, I found dried peaches retailing for 17 cents a pound, on the average. At that very time in California, the average price—in fact, Mr. Sunderland stated that the maximum price was about 3 cents—the average price was probably 2½ cents. What did that mean? That meant that for every dollar the housewife paid for dried peaches, the farmer out here got 15 cents. There was a gap of 85 per cent, theoretically, covering the cost of transportation and distribution. Under unorganized efforts the producer was getting 15 cents of the consumer's dollar, and under the organized method 75 cents of the consumer's dollar. Is it worth while to organize? It seems to me that tells its own story. That is only one of the possibilities of organized effort.

During the same visit to New York I spent some very interesting hours with the manager of the foreign department of the New York City Bank, one of the largest, if not the largest, in America. This gentleman had just returned from Brazil, where he made a survey. I said to him, "What are the possibilities in South America, more especially in Brazil, for California dried fruits?" He said, "Big." And I said, "Can you give me some idea of the conditions?" He said, "I have got a lot of information compiled that you are welcome to." He pulled out a folder and we looked it over, and imagine my surprise to find among other things that the preceding year, California represented just 1 per cent of the imports into Brazil of prunes, despite the fact that California is the greatest prune producing state in all the world, and raises the finest prunes in the world. Brazil bought only 1 per cent of her prune requirements from California, the other 99 per cent coming from Europe. I said to this gentleman, "This is a revelation. How do you explain it?" He said, "You people are way behind the times out there. Europe gets 99 per cent of the prune orders because Europe is thoroughly represented in Brazil by an efficient selling organization. Furthermore, the 1 per cent of the stuff that you send to Brazil is unfit for local standards; it gives your product a bad eye." He said, "You tell me as State Market Director you propose organizing the prune growers and the other growers of California. That is exactly along the right lines. When you have your people organized out there and they are in a position to furnish standardized products that are fit to eat, and you people will send trained selling organizations to remain permanently in South America, the market will be yours for the taking." Individual growers could never hope to bring about those results. Collectively those things are comparatively within easy reach.

Not only have the growers themselves organized into strong marketing associations, but these associations have become federated, and through federated action great things are possible, not the least of which is the development of the world's markets. You and I can not appreciate the future that is ahead of this wonderful commonwealth. We are today in our merest infancy. I rode down the valley the other night on the train and contrasted the wonderful vineyards and orchards and the beautiful little cottages with their curtained windows and their front yards, and the vines climbing up the doorways and windows, and the classic play

schools and schoolhouses scattered all through the valley, and the untold numbers of happy, prosperous high-minded American men and women. When I contrasted that picture with the picture that I recall of traveling through the same territory only a decade or two ago, it was most striking, and I could not but help say to my fellow passenger, "What a wonderful and beautiful picture this is and how marvelous the contrast with conditions that prevailed here only a decade or two ago," and then I began to exercise my imagination and I could not but feel that the picture that is visible today along that wonderful valley is going to be duplicated in every nook and corner of the State of California, and that the thing that is going to make it possible to duplicate that attractive picture, and to duplicate it on the broadest possible scale, is these very farmers' marketing associations, so severely condemned by that distinguished statesman, Senator Brown. It is through your efforts that untold prosperity and untold happiness and untold wealth is yet to be brought to this great commonwealth. As I sat in that beautiful court within a stone's throw of where I am standing, and partook of my lunch this afternoon, looking up I noticed an inscription on the wall of the courtyard, and this is what it said: "He who hath not vision shall perish." That is true. He who hath not vision shall perish. The prime difference between the progressive and the nonprogressive nations of the world, the prime difference between the progressive and the nonprogressive individual, is the difference between having vision and lacking vision. China, for example, lacks vision. For thousands of years she has been, so to speak, petrified. The American people cultivated vision. The people of California especially have cultivated vision, and today we rank foremost among the progressive peoples of the world. I have a vision. Let me share it with you. I see before me at no distant time in the immediate future, a wonderful headquarters, in a city say like London, England, a wonderful headquarters, thoroughly equipped, presided over by one of the ablest marketers perhaps that the country can produce, a man of the type, for example, of our friend Mr. Powell. I see before me in these great European headquarters departments—each department representing some great horticultural or agricultural industry of California—the raisin department, the prune department, the peach department, the alfalfa department, and so on, down the line, each in turn presided over by an expert, peculiarly fitted for his function. I see a wonderful commercial machine with its headquarters in that great European city, and this machine reaching out to every nook and corner of Europe, touching every commercial spot, in closest contact with every important distributor of foodstuffs, in immediate touch with the greatest co-operative societies of Europe that have been developed to wonderful proportions in more recent times. I see before me the vision of a duplication of that picture, located somewhere in South America, performing for that country precisely the same function. I see before me the duplication of that machinery over in the Orient, doing heroic service along the line of those things, and among other things, of educating the four hundred millions of people in China alone to the value and merits and economic value of the various food products raised in this commonwealth. I see the world enriched through that effort. I see this commonwealth enriched through that effort. I see tremendously added pros-

perity and happiness and a finer breed of men and women in this state than the history of the world has ever been able to show.

The Chairman—Now, this is a question our State Commissioner said was worthy of discussion and we know it is, and, if it is your pleasure we will devote a few minutes to it. If any of you have anything to say, or have any questions you wish to ask, we will give you a few moments now. I know we were all deeply impressed with this vision that Colonel Weinstock had and that is a very practical proposition, too, and nothing at all but what we will see by and by, when we get thoroughly enough organized and get big enough to take in the whole world and feed the world with these products of ours. We will have these headquarters, these display stations in these various countries. South America is a great field. Europe is a great field. The Orient is a great field; and we can produce the goods here, and we are just learning, these co-operative associations, are learning how to handle it. Of course, we had to do that first. There is no use shipping dirt to these people. You have to put your goods up in the right way, and I am sure if California producers—I will say this—it does not seem boasting, either; I will say that the California producer is the peer on earth in intelligence, in the method and manner and equipment with which he carries on his business. There is no other place compared with us. I heard a gentleman some years ago from the East—a friend of mine who came to one of our Conventions, and he spoke of the ways back in the Middle West. It was in a bankers' convention. "You fellows don't look like farmers." I say this not in a boasting way, but the farmers of California are the peers or the superiors of any farmers on earth. You can carry out the methods of production, the method of handling and the method of marketing superior to any others, and if we can not capture any market in the world, if we set about it, I shall be greatly disappointed. We can capture any market in the world, if we will just set about it in the right way.

Mr. Le Roy—I would like to ask one question. I want to know if there is any way of getting around the supply and demand when all these millions of eggs are put in cold storage. A great many of our Oriental friends found the market full of fish and they dumped them into the ocean. Is there any way of getting around that supply and demand?

Colonel Weinstock—You have raised two questions there, one on eggs and the other on fish; which shall I deal with?

Mr. Le Roy—They are both the same.

Colonel Weinstock—Let us take up the egg question. The greatest blessing that is falling you and me as consumers, so far as eggs are concerned, is the cold storage system, which makes it possible during the best period of the year, to conserve the surplus which makes it possible during the famine period of the year to provide us with eggs at prices within reach. Suppose we made the storing of eggs a crime? What would happen? The first thing would be this: at that period of the year when in the language of Mrs. Malaprop the hens lay freely, we would be smothered in eggs. The supply would be so much greater than the demand that eggs would go begging and the poultry producer would get back only a fraction of his cost and he would be ruined, and at that season of the year. Hens do not lay evenly every month in the year.

They lay bountifully certain seasons and at other seasons sparingly, and when the hens do not lay plentifully, eggs will be beyond the reach of the average consumer. So that the greatest blessing that has come to the consumer, is the storage system which makes it more nearly possible to equalize the supply and spread it over the year.

In the matter of fish. That is a great problem. As you probably know, the law passed by the state legislature two years ago created a bureau for the commission known as the State Fish Commission. The purpose of the bureau is to stabilize as nearly as possible the fish industry and to popularize fish, and the State Market Director was given power in order to check profiteering in fish, to determine the maximum price to be paid fishermen, to the wholesaler and to the retailer. At this point, some of you may say, why should the state pick out fish? If the state proposes to go into the price fixing game, why not fix the price on everything? The difference is this, between fish and all things else: cabbages and prunes and apricots and peaches and oranges are private property and, excepting in war times, and even in war times, the government is slow to engage in a price fixing system. Fish belong to all the people and it is state property and it has been determined by the highest courts in the country that fish being state property, the state has the right not only to regulate the catch of the fish as it does through its Fish and Game Commission, but it desires also to regulate the selling of fish. Hence the state can legally fix the price of fish. Now for a year and a half, the state through its Fish Exchange fixed prices for fish. During the greater part of the time the activities were confined to the northern part of the state. It was a new problem. There was no precedent to guide the state. No experience whatever. The way had to be felt very carefully and very slowly, and when after a year or more the way had been found in the north, we proceeded to come to the south. Those who wanted to profiteer were against the proposition. The wholesalers, the retailers and the fishermen among whom are many who are willing and glad to sell their fish at a reasonable price, and among whom there are also those, as in every other activity, who want to put on all the traffic will bear and get the limit.

That element chafed under state direction, and they felt as a colt would feel out in the field. If you or I attempted to catch a colt and he could talk, he would say, "Not on your life. You can't put any harness on me if I can help it. Catch me if you can." Those engaged in the fish trade would rather be absolutely free. The result was a great outcry and great agitation, and the fishermen went on strikes and a bill was submitted to the legislature which practically wiped out the Fish Exchange and created a new commission which had no powers of fixing prices and had impossible things to do. Two months have intervened since that bill was taken up in the legislature and acted upon; and during the intervening time the State Market Director decided to suspend price fixing operations. He decided to do that in order that the Governor and the people of California might see the difference between before and after, and better be enabled to make comparisons between the two conditions. The Governor, in his wisdom, after doubtless having informed himself from every angle of the proposition, refrained from signing the bill which had for its purpose the wiping out of the price fixing power. Many of these difficulties that you speak of have arisen in the last month

or so. There has been a great surplus of fish and an inadequate market. The question might arise: what would have happened if you had not suspended your price fixing power? The answer is: if the State Fish Exchange had been on the job, we could have very largely stimulated the consumption of fish, because we have an advertising fund created by license fees, contributed by dealers under the law, and this fund is used for advertising surplus fish at popular prices, and in that way increasing consumption. A month or two ago or perhaps a little longer than that there was a surplus of certain varieties of fish on one day and the price was cut, and the consumption that day was double over what it had been the preceding day.

Now, since the Governor has, in his judgment, seen fit to permit the State Fish Exchange to go on with its work as it has been doing in the past, we hope to be able to get in the saddle again and stabilize the fish industry, which has become demoralized during the past several weeks, and when we shall have stabilized the fish industry, we will have done for that what the peach industry did for itself, and what the prune industry has done, and it will make it possible to minimize the diversion of table fish into fertilizer and secure for the fisherman a living price for his fish, and at the same time make the price to the consumer a fair and reasonable price. Those are our objectives and I hope we can count on your sympathy and support in endeavoring to reach those objectives in the fish industry.

Mr. Le Roy—During the last two months has been about the only time the average person could afford to buy any fish in Los Angeles. Before that, they were up to anywhere from 25 cents to 30 cents a pound. Four or five years ago, you could buy almost any kind of fish from 10 cents to 15 cents a pound. During the last two months we could get it for that, but before that from 20 cents to 35 cents was the best you could do on the different kinds of fish. I wondered where the consumer got off.

Colonel Weinstock—May I answer that?

Mr. Le Roy—I asked that to find out where the trouble was. It seems to me that when the price was not fixed, we were getting fish for 10 cents and 15 cents less.

Colonel Weinstock—Our friend here is not aware of this trade fact, and he finds himself making the same comparisons that were made up north recently. They said, "Look at salmon." In the month of March, when the Fish Exchange was operating, salmon was retailing at 35 cents and 40 cents a pound, and now since the Exchange is not operating it is 25 cents a pound. That would be like comparing the price of strawberries in the midseason with other seasons. Fish have seasons the same as fruits have and the price within the season automatically must be lower than between the seasons. The fish catching season begins about the middle of April, and you are now comparing the prices during the period when there are large catches with the period when there are small catches preceding that date.

Mr. Le Roy—I was comparing it for the last four or five years.

Colonel Weinstock—The only way to compare is to compare month by month. That is, April with the previous April, and March with other Marches. Only thus can you get a comparison. I am satisfied that for the past two or three weeks, the retail price has been lower than it has

for corresponding periods in previous years, exactly the same as the price of peaches during the fall of 1915 to the consumer in California was lower than they have been since. But what would have followed if that had become the permanent condition? You would have your peach growers rip up their trees by the tens of thousands as they began doing about that time. The peach industry had become an unprofitable industry, and the peach tree in place of being an asset had become a liability, exactly as the raisin vine before the organization, in place of being an asset had grown to be a liability, and while for the time being, because of the glutted market, the consumer got his raisins or his peaches at his own price, it was only a matter of time when the production would be minimized. Now, the fishermen had been losing money, and did not have a market. But let that become the permanent condition and what would happen? Hundreds of fishermen would be driven out of the game. Production would be minimized and then you would have paid a compound interest for the trifling advantage that you gained.

Mr. Waite—What has been done in regard to compressing alfalfa hay to other localities than California, when there is a surplus?

Mr. Lytle—Comparatively little as yet. The marketing people of the state previous to the entry of the board into the business of co-operative marketing, as dealers, they were the leading dealers. There has been more compressed hay shipped out of California than any other district. At least so far as came within my observation or knowledge. It would naturally follow that co-operative organizations handling that product would take up that work and make the most of it, and we have been feeling out a number of lines and sounding markets in various parts of the world, and finding out in what form they can use our product, and in what form we can get it to them economically. As soon as we have all this information together we expect to act upon it. To us at the present time, it seems more likely that for export purposes alfalfa will be handled in the form of meal rather than compressed. But doubtless both forms will be used. The information so far collected leads us to the belief that the meal suits the consumer better.

The Chairman—We will now proceed with an interesting paper, "The Relation of the Experiment Station to Practical Fruit Growing," by Professor Whitten of Berkeley.

THE RELATION OF EXPERIMENT STATION WORK TO PRACTICAL FRUIT GROWING.

By J. C. WHITTEN, Division of Pomology, University of California.

Progress in fruit growing depends upon three primary factors, which must go hand in hand: (1) The effort of the fruit grower, (2) economic development and (3) scientific investigation.

There are many problems which only the fruit grower can work out for himself. In the main, he should be guided by the best local practices employed by the more prosperous fruit growers in producing, handling and marketing the fruit crop. The very fact that a community has developed a prosperous fruit-growing industry is evidence that it has been based upon sound practice and years of organized effort in building up the industry. One should not lightly discard established practice to adopt, indiscriminately, new methods, new varieties or alleged "short cuts" to success. Innovations should be tested only on a small scale until their superior worth has been proven and they can be adapted to the local need.

Economic development is constantly bringing about better markets and marketing; better legislation, improved machinery and apparatus and conditions which influence the growth of the fruit-growing industry.

With the rapid development of fruit growing problems of a scientific nature arise, the solution of which requires laboratories, apparatus, experimental grounds and men trained for investigation. The solution of this type of problem falls within the province of the experiment station. The success of experiment station work and its application to commercial fruit production depend upon intimate association and co-operation between the experiment station worker and the fruit grower.

Spraying for insect and fungous diseases is a specific problem which illustrates how experiment station investigation and progressive work of the orchardist have gone hand in hand in revolutionizing the fruit-growing industry in recent years.

The first step was to find a poison or a fungicide which, when applied to the tree, would kill the pest. To know when to apply it required the patient working out of the life history of the insect or the fungus. It is obvious that the preventive must be applied when the pest is in a susceptible stage and just before it attacks the tissues of the tree. Often it was found that the spray which successfully destroyed the insect or the fungus also burned the tissues of the plant. It became necessary to find correctives which would neutralize this burning without destroying the efficacy of the spray.

What has been accomplished has required years of effort on the part of entomologists, pathologists, chemists and pomologists who have had to devise working methods and overcome obstacles which were difficult and often baffling. It has likewise called for patience, industry, bold progressive confidence and even forbearance on the part of the fruit grower. Often the latter has experienced failure because the exact time or method of applying the spray, under his local conditions, was not fully known. More discouraging yet was the fact that sometimes fruit or foliage has been seriously injured before it was known that difference in local conditions, such as atmospheric moisture, succulence of foliage, or peculiarities of a variety of fruit may result in loss or failure in one locality when the same treatment results in success in another. The writer has vividly in mind instances where the fashion of spraying would have suffered ignominious death in a neighborhood, had a few courageous fruit growers not quietly ignored temporary failure and tried again, with a revised spray, and finally achieved success.

The work of the fruit grower and of the experiment station has been accompanied by that of the manufacturer of spray mixtures, spray machinery and other apparatus and supplies, the evolution and perfection of which has been essential to efficient control of insects and fungi.

Work along the above lines is still making rapid progress. The fact that a majority of the more destructive orchard troubles may now be prevented assures us that those which are not yet being successfully met may yet be brought under practical control.

Pruning practice was formerly based upon the idea of securing a given, outer mechanical form of the tree. It is making rapid progress since we began to find out more about what is going on inside the tree. Formerly we regarded the tree much as a wheelwright does when he shapes a central hub, with spokes radiating equidistant and these surrounded by a symmetrical rim, intended to stay in place until it wears out.

Now we think of the tree as a living, plastic shapable thing which does not "stay in shape," but which responds to everything which we do to it. We prune more with a view to enabling the tree to make a proper shape itself, than with a view to shaping it arbitrarily.

We encourage the development of about three main limbs, spaced six or eight inches apart on the trunk, to secure a strong fork and avoid crowding of the limbs, in place of the former pocket at the fork and crowding of the limbs like a half dozen wedges driven into the top of the trunk. These limbs are allowed to divide into two each, waist high, so as to secure about six permanent main limbs.

Once these six main limbs are established, subsequent pruning consists of thinning out rather than heading back. Repeated, severe heading back is now known to result in smaller, weaker trees. Severe heading results in rank sprouts arising from the point of heading. These rank limbs continue length growth until late in the season. The plant food digested daily in the leaves is mainly

used up in continued length growth, but little of it is devoted to root and trunk growth, to fruit bud development or as stored plant food reserves in the tree. These rank-growing, upright limbs tend to shade out the fruiting spurs below. Most of their growth is pruned off and wasted at the next heading.

Trees not headed back tend to produce side branches throughout the length of the main limbs. Terminal growth is but little in excess of lateral growth. Length growth ceases early and terminal buds are formed. After terminal growth is checked the plant food digested daily in the leaves is devoted to the diameter development of trunk, limbs and roots, to storage in fruit buds and to the accumulation of stored plant food reserves.

Furthermore, the tree becomes more resistant of drought, sun-scald, spring frost or other trying conditions. Rank new length growth has soft, succulent tissues and thin sap. This results in the rapid evaporation of much water and susceptibility to drought or cold. Branches that finish length growth early have firm, small cells, ripen their tissues, waste but little water, possess sap concentrated with sugar and of low freezing point. The fruit grower has only to recall the difference in appearance between the pale, soft, transparent, yellowish-green of the water sprout, as opposed to the deep, rich green and firm, leathery texture of twigs that early form a terminal bud, to realize that the latter digest more plant food and use less water than the former.

Summer pruning has been a vexed question. Sometimes it has given good results and again it has greatly injured the trees. Judiciously applied, it may be very beneficial in checking the development of rank sprouts where branches are not wanted or thinning out soft, succulent, useless parts that act as parasites on the tree. It may be very injurious if one cuts without regard to the firmer, useful tissues that are building up the tree.

A knowledge of the foregoing and other facts concerning plant growth, taken by themselves, are not adequate to successful pruning practice. Once the fruit grower knows them and comprehends their significance, however, they are very useful in enabling him to prune more efficiently. Not all orchards respond just alike, due to difference of variety of fruit, soil, weather and other surrounding influences. Once a fact of plant response is known, its application to a given orchard has to be worked out by co-operation with the orchardist. He can usually apply it better than anyone else for he knows his trees and how they respond in their individual location.

Many problems remain to be solved in irrigation, cover crops, pollination, root-stocks, tillage and other factors relating to production, as well as in the drying and storing of fruit. Many of these problems are suggested by the orchardist himself. Hints for their solution come from association with the fruit grower. As truths are from time to time worked out, their application to the industry depends always upon the full and constant co-operation between the fruit grower and the man who is carrying on the investigation problems.

The Chairman—What is the practical advantage to you fruit growers? What good have you gotten out of these experiment stations, or the experimental work at Berkeley? Have you learned anything? Have they helped you to grow more and better fruit? Any questions that you wish to ask? The great question and sometimes in my own case, I have asked some of these learned gentlemen about certain propositions or problems that came up to me, and they would say, "If you do this and don't do that and things could turn out this way and things shaped up in that way, you will possibly get such results, but we are not certain of it yet." So far as the advantage to me is concerned, it was that we had to go along very largely and pioneer our own way; but as Dean Hunt said some time ago at a meeting, "I hope you will be able to apply somewhat definitely some of these points." I said, "How long?" He said, "Now in England I remember the report that said they were about seventy-five years in arriving at conclusions, but we think we can arrive at conclusions within forty years." That was very encouraging to a fellow who had to make his living as he went along. I know by and

by our children will have some advantage and learn something to take advantage of. And of what about the experiments made by these scientific gentlemen? I am not belittling it at all. They have had to learn it, and they are a conservative department. You notice that, and they don't want to speak confidently of a thing until they have learned it, because they sometimes thought they had learned something and found out when they went among the fruit growers that it did not work out and they had to learn it all over, and they have got to be very conservative and want to be sure, and I guess Dean Hunt had experience along that line and he did not want to speak too confidently of what he had learned.

Mr. Fleet—I have been in California thirty-one years, and there is not a set of men that I would rather have visit the ranch than the experiment station men. There has never been one visited my ranch but what I have learned something, and I have never visited an experiment station but what I have found out something that benefited me as a fruit grower and which I never knew before. And I may say that on our ranch we are cranks on producing good trees and we thought we knew where to get the best lemon trees in the State of California until I visited the Riverside Experiment Station, and when we had some of those professors come to our ranch; and I wish to say that I certainly appreciate the work of the Riverside Experiment Station and of the Berkeley Station, and I believe the work is progressing on a firmer basis at this time than I have ever known it in my thirty years experience. Now, the one thing of bud selection. I followed our friends thirty years ago on bud selection. But we have studied lately the subject, touched on this afternoon, in regard to roots. In keeping records in 1917, out of 31,000 trees we discarded a little over 600 trees and replaced them with better trees or with trees that were from buds taken from trees of record, and it was the work of Mr. Shamel that braced us up, and while I have not spoken to him about the matter of bud selection, I learned at the experiment station that in bud selection you are three steps from the ground in budding. I came home and went into our nursery where there were seven to eight thousand trees to be budded and began at once to show my nurserymen and others the different types of seed bed stock that came out of the same seed bed. But for the experiment station I don't know that I would have done that. While we have gone to the trouble of discarding weak trees, the different types of shape of the leaves or the growth never occurred to me until it was shown to me in twelve different types of seed bed stock in one row. It seems to me there is no end to the things we can find out at the experiment station and bring them in to our orchards and work out our problems.

Chairman Hecke—The northern brothers are well acquainted with the work done by Professor Whitten. We have Professor Tufts here with us, and I would consider it a privilege to listen to him for a few minutes, as to the work accomplished at Davis and the enormous interest aroused among the growers of the north.

THE SO-CALLED "NEW SYSTEM OF PRUNING."

By W. P. Tufts, Berkeley, California.

I am very glad to be here this afternoon and say a few words in regard to the so-called "new system" of pruning. It is not so new after all. It is simply the application to our conditions in California of well-known laws of plant physiology.

It is rather difficult in a few minutes to outline or say anything that might be of interest to you with regard to this method of pruning which we have been advocating throughout the state; but it might be interesting to give you some idea as to how it has been received.

I think we have entertained at Davis during the past winter between eight hundred and a thousand fruit growers. They came in ones, twos, threes, and as many as seventy-five persons at one time.

The method of pruning which we are at present recommending differs essentially from the system that has been used in the past, in the severity of the cutting. We have found that the lighter the pruning the heavier and stockier the trees become, not only the trunk but also the branches. This statement is based on the measuring and weighing of several thousand fruit trees which we had occasion to dig from the orchard. These trees had been in the ground two years. Half of them had been pruned, and the other half had received no pruning. In addition to these actual weights, measurements on all species of deciduous trees show that the lighter the pruning the heavier the branch and the heavier the trunk growth resulting.

By this system of lighter pruning we have been able to bring trees into bearing from two to three years sooner than has been the customary practice in California. For example, Climax plums thus pruned have, during the third season, yielded a crate of fruit to the tree, and the fourth season in the orchard these trees produced two crates of fruit to the tree. On the other hand, trees pruned by the standard method yielded no fruit during the third season, and between seven and ten pounds of fruit to the tree the fourth season. In the same way with apricots, approximately thirty pounds were obtained the third season and from sixty to one hundred pounds the fourth season. In like manner we might enumerate the yields throughout the list of deciduous fruits. In addition, it should be stated that the same trees that have yielded these large crops so early in their life are today from a third to a fourth larger, and are in better shape than those trees which received the heavier pruning commonly accepted as standard in California.

Just a word in detail as to how the system we are recommending differs from the commonly accepted practices. We recommend the planting of a medium-sized tree rather than a large one. At planting time the young tree is headed back at a height of twenty-four inches above the ground. During the first April after planting the orchard is gone over and all branches undesirably placed are pinched back, leaving untouched three or four young shoots which are eventually to form the main framework of the tree. Depending upon the growth the trees have made, these three or four main branches are, at the end of the first growing period, pruned back lightly, in general, fifteen to thirty inches from their juncture with the main trunk. Almonds, apricots, peaches and Japanese plums, or, in other words, those fruit trees which form lateral branches during the current season's growth, should at the first heading back be cut above the secondary branching so that at the end of the first growing period three to five or six permanent scaffold branches are formed.

During the month of May of the second summer, if the trees are making a good growth and moisture conditions are satisfactory, the young plantation should be gone over and all undesirable growth thinned out. By undesirable growth we mean any shoots which will not be left ultimately to form the framework of the tree. In addition to this thinning during the second summer, we also recommend a light heading back to be done at the same time, provided sufficient branching or "spread" has not already been secured. As a usual practice, no summer pruning is recommended during the third or fourth summer except the removal of sucker wood and the heading back of over-vigorous growth.

After having once established a sufficient number of scaffold branches with the proper spread, no further heading back is recommended until the trees come into good production. After that they should be handled as full-bearing trees and such pruning methods practiced as will insure a succession of profitable crops, together with a sufficient amount of new wood growth.

The heading back during the second summer results in the securing, under ideal conditions, of two years' shaping during one season, thus putting forward the fruiting by one year. This, accompanied by light pruning and a thinning out

process wherever advisable, gives the early crops and the larger, stockier trees above noted.

The experiments on which we base the above statements are now in their fifth year, and include almonds, apricots, cherries, peaches, pears, plums (Japanese and European), and prunes. Without doubt, the pruning system to be employed in any particular instance depends very largely on specific and varietal characteristics. A thorough knowledge of the varietal characteristics is necessary before trees can be pruned intelligently.

A resolution is read by the Secretary.

The Chairman—You have heard these resolutions. What is your pleasure?

A motion is made and seconded that they be adopted. I would like to amend the first resolution to read: "An agricultural resident." I also move that "Southern California" be inserted there, because we have been studying it recently. The regents of the California University are composed of seventeen persons, fourteen out of the seventeen coming from around San Francisco, two of them from Los Angeles, and one from Fresno. It seems to me that Southern California ought to be represented on that board of regents, more than two out of fourteen. I move that that be put in there so as to have three from Southern California out of the seventeen.

The amendment is seconded.

Mr. Pierce—This matter was presented in the committee and it was decided by the committee that this wording savored a little too much of politics. We want to keep out of that. The fact that our present governor is from the southern part of California and that there is an abundance of material here, and that that material could be used to good advantage, we thought it best to leave it in this form. We did not want to get into anything that will cause us future trouble. We want nothing that we will have to apologize for and I think we will leave with Governor Stephens the appointment of a member of this board, and I think one coming from northern California hardly enters the idea contained in this amendment, but I object to the insertion of it here in this Convention.

(*The amendment is put and defeated.*)

The Chairman—We will now vote upon the motion endorsing the resolution.

(*The motion is carried and the resolution adopted by this Convention.*)

Chairman Hecke—LADIES AND GENTLEMEN:

This ends the Fifty-first Fruit Growers and Farmers' Convention. It has been a very successful Convention—I believe, perhaps, one of the most successful Conventions ever held under the auspices of the State Commission of Horticulture. Within two months from now, the State Commission of Horticulture will have ceased to exist. I believe the members of the state commission may be proud in looking over the work that has been accomplished. The fact is outstanding that in spite of so many major pests outside the boundaries of our state, none of them has found a foothold in the State of California.

This is the last address that a State Commissioner of Horticulture will make. I personally desire to thank you for the splendid spirit of co-operation that you people in the south have always given to the State Commission of Horticulture.

I received a wire from Chico, Butte County, inviting the next Convention to be held in the north. I sincerely hope that the successor of the State Commissioner of Horticulture will see his way clear to locate the Convention in the northern part of the state. They have offered to provide a large sum of money for the entertainment of visitors and I am quite sure that the program provided will be as good as has been provided for this Convention at Riverside. And, may I ask you represenatives of southern California horticultural interests, not to forget that in the north there are also districts deeply interested in growing citrus fruits who would like to see representatives from southern California attend a Convention there. You will be welcomed as much there as northern members were welcomed at Riverside. I thank you.

The Temporary Chairman—I voice the sentiment of this Convention when I say that we appreciate the splendid leadership of Mr. Hecke and all these other gentlemen, and I trust that the new method will prove as effective. It will have to be going some if it does.

Chairman Hecke—As a farmer and a fruit grower, I shall continue doing my level best to bring strength to the support of the California farming interests.

Mr. Dean—As one of the visitors from one of the outside states, I, representing the state of Washington, wish to show my appreciation of the courtesy and hospitality that has been extended to us on the outside by your kind-hearted people. This trip and this Convention, to my mind, is one of the most beneficial and one of the best Conventions that I have ever visited, and each of us can take back to our home states information that can not but help elevate the horticultural interests of our several states.

Mr. Lyne—Coming from British Columbia, I wish to echo the sentiments just expressed. I most heartily concur in stating that this is the most enjoyable convention and the most successful one and most instructive that anyone would wish to attend.

Thereupon the Fifty-first Fruit Growers and Farmers' Convention adjourned.

CROP REPORT AND STATISTICS.

MONTHLY CROP REPORT.

STATE DEPARTMENT OF AGRICULTURE.

Compiled in co-operation with U. S. Bureau of Crop Estimates, San Francisco, from Reports of County Horticultural Commissioners and Government Crop Reports.

Prepared by Geo. P. Weldon, Chief Deputy; O. W. Newman, Field Deputy.
July 31, 1919.

Counties	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Figs (per cent)	Grapes (per cent)	Lemons (per cent)	Olives (per cent)	Navel Oranges, %	Valencia Oranges, %	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	25	#	55	#	80	#	#	#	#	#	90	55	80	#
Butte	55	100	#	100	#	#	55	50	#	100	40	#	60	#
Calaveras	#	#	#	#	90	#	#	#	#	#	#	#	#	#
Colusa	75	#	#	#	100	#	#	#	#	#	#	#	85	#
Contra Costa	30	#	50	#	100	#	60	#	#	85	100	#	85	#
El Dorado	#	#	#	#	#	#	#	#	#	#	90	100	#	#
Fresno	#	#	105	101	98	#	70	75	#	100	#	90	90	#
Glenn	100	#	90	#	#	#	#	#	#	#	#	#	90	#
Humboldt	#	90	#	#	#	#	#	#	#	#	#	#	#	#
Imperial	#	#	#	#	100	#	#	#	#	#	#	#	#	#
Inyo	#	80	#	#	#	#	#	#	#	#	#	#	#	#
Kern	#	#	100	#	#	#	#	75	#	100	100	#	100	#
Kings	#	#	100	#	100	#	#	#	#	100	#	#	100	#
Lake	90	#	#	#	#	#	#	#	#	#	100	#	100	#
Los Angeles	90	90	100	100	100	75	70	66	72	90	70	70	#	107
Madera	#	#	85	100	100	#	50	#	#	90	#	#	#	#
Mendocino	#	80	#	#	100	#	#	#	#	#	90	#	80	#
Merced	100	#	90	101	95	#	80	#	#	90	#	#	#	#
Monterey	#	95	50	#	#	#	#	#	#	#	#	#	#	#
Napa	60	100	50	#	100	#	#	#	#	100	100	100	100	#
Nevada	#	80	#	#	#	#	#	#	#	#	45	80	#	#
Orange	#	#	101	#	#	75	#	80	80	#	#	#	#	115
Placer	60	85	#	#	95	#	60	#	#	100	65	65	#	#
Riverside	35	100	102	#	100	80	50	60	80	80	50	#	#	100
Sacramento	85	#	95	#	100	#	80	50	#	95	100	85	95	#
San Benito	80	90	80	#	#	#	#	#	#	#	90	#	100	#
San Bernardino	#	100	90	#	95	75	85	60	60	95	#	#	#	100
San Diego	#	90	85	#	90	75	50	#	#	#	#	#	#	#
San Joaquin	80	#	100	90	98	#	80	#	#	100	70	100	100	95
San Luis Obispo	85	#	#	#	#	#	#	#	#	#	#	#	#	100
Santa Barbara	#	#	#	#	#	80	90	#	#	#	#	#	#	105
Santa Clara	100	95	85	#	100	#	#	#	#	100	100	100	105	100
Santa Cruz	#	85	65	#	#	#	#	#	#	#	85	#	#	#
Shasta	#	#	#	#	90	#	30	#	#	#	#	#	100	#
Sierra	#	#	#	#	95	#	#	#	#	#	#	#	#	#
Siskiyou	#	90	#	#	#	#	#	#	#	#	#	#	#	#
Solano	50	#	75	#	90	#	#	#	#	95	95	80	85	#
Sonoma	#	90	80	#	100	#	90	#	#	85	95	90	90	100
Stanislaus	110	#	100	100	100	#	90	#	#	95	90	#	#	#
Sutter	90	#	#	100	90	#	#	#	#	100	100	#	90	#
Tehama	95	#	90	#	95	#	80	#	#	95	95	90	90	#
Tulare	#	#	103	101	100	85	30	60	85	100	#	100	108	#
Ventura	#	#	95	#	#	75	#	85	#	#	#	#	#	105
Yolo	80	#	100	100	100	#	60	#	#	100	80	90	85	#
Yuba	60	#	#	100	#	#	110	#	#	#	110	80	#	#
State average	75	89	90	101	99	76	65	61	75	98	92	80	100	108

Figures indicate conditions of crop in per cent on the basis of 100 as normal.
#Not grown commercially.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF MAY, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	70
Passengers arriving from fruit-fly ports	4,228

Horticultural imports:

	Parcels
Passed as free from pests	156,618
Fumigated	1,684
Refused admittance	40
Contraband destroyed	56
Total parcels horticultural imports for the month	158,398

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli and *Pseudococcus* sp. on bananas.

From China:

Lepidosaphes gloverii, Parlatoria pergandii and *Hemichionaspis aspidistrae* on pomelos.

From Florida:

Phomopsis citri and *Lepidosaphes beckii* on grapefruit.

From Hawaii:

Diaspis bromeliae and *Pseudococcus bromeliae* on pineapples.
Coccus longulus on betel leaves.

From Idaho:

Scab and Rhizoctonia on potatoes.

From Japan:

Lepidosaphes ficus on Japanese pears (fresh fruit).
Pseudococcus comstocki on wistaria.
Mites (undetermined) and *Thyridopteryx* sp. on daphne.
Larvae of borers in Japanese cherry.
Coleopterous borers in dead twigs of *Acer* sp.
Pseudococcus sp. and lepidopterous larvae on *Retinospora obtusa*.
Larvae and pupae of lepidopterous insects in nursery stock packing.
Bruchus pisorum in peas.

From Mexico:

Chloridea obsoleta in tomatoes.
Weevil (undetermined) in beans.
Lepidosaphes gloverii, Chrysomphalus scutiformis and *Parlatoria cinerea* on limes.

From Ohio:

Aphis and mildew on rose plants.

From Oregon:

Scab and Rhizoctonia on potatoes.
Epochra canadensis in gooseberries.

From Tahiti:

Chrysomphalus aurantii on lemons.

From Tasmania:

Fungus (undetermined) on apples.

From Washington:

Scab and Rhizoctonia on potatoes.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	19
Fish boats inspected	12
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	91,125
Fumigated	23
Refused admittance	6
Contraband destroyed	7
Total parcels horticultural imports for the month	91,161

Pests intercepted.

From Central America:

Pseudococcus sp. and *Aspidiotus cyanophylli* on bananas.

From Hawaii:

Pseudococcus bromeliae and *Diaspis bromeliae* on pineapples.

From Japan:

Parlatoria pergandii var. *camelliae* on camellias.
Pseudaonidia duplex on azaleas.

From Oregon:

Rhizoctonia on potatoes.

From Texas:

Calandra granaria in sorghum seed.

From Washington:

Rhizoctonia on potatoes.

From Wisconsin:

Pseudococcus longispinus on dracenas.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	20
Fish boats inspected	30
Passengers arriving from fruit-fly ports	62

Horticultural imports:	Parcels
Passed as free from pests	6,706
Fumigated	0
Refused admittance	2
Contraband destroyed	1
Total parcels horticultural imports for the month	6,709

Pests intercepted.

From Central America:

Aspidiotus cyanophylli on bananas.

From Mexico:

Carpophilus hemipterus in dried bananas.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	5
Passengers arriving from fruit-fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	14

REPORT FOR THE MONTH OF JUNE, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	73
Passengers arriving from fruit-fly ports	4,166

Horticultural imports:

	Parcels
Passed as free from pests	140,705
Fumigated	1,406
Sterilized	4,000
Refused admittance	91
Contraband destroyed	58
Total parcels horticultural imports for the month	146,260

Pests Intercepted.

From British Columbia:

Scab and Rhizoctonia on potatoes.

From Central America:

Icerya sp. on bananas.
Ceroputo sp., Omiscid sp., and Formicid sp. on orchids.
Pseudococcus sp. on hibiscus.

From China:

Araecerus fasciculatus in dried vegetables.
Lepidopterous larvæ in dry beans.
Lepidopterous larvæ in dry roots.
Cylas formicarius in sweet potatoes.

From England:

Pseudococcus sp. on heather.

From Hawaii:

Coleopterous larvæ on silver sword.
Pseudococcus bromeliae and *Diaspis bromeliae* on pineapples.
Coccus longulus on betel leaves.

From Idaho:

Scab and Rhizoctonia on potatoes.

From Illinois:

Archips obsoletana on rose plants.
Aphis sp. and dipterous pupa on rose plants.

From Japan:

Formicid sp. and mites in bulbs.
Pseudococcus sp. on umbrella pine.
Lecanium sp., *Pulvinaria* sp. and *Eulecanium cerasorum* on wistaria.
Aphids and thrips on maple.
Pseudaonidia duplex on camellia.
Aphid sp. on juniper.
Lepidopterous pupa on daphne.
Lepidopterous larvæ on euonymus.
Lecanium sp. on nandina.
Lepidopterous pupa on cedar.
Formicid sp. on sago palm.
Flat-headed borer in photinia.
Millipeds, Drosophilids and lepidopterous pupæ in packing.
Pseudococcus sp. and *Aspidiotus* sp. on assorted pot plants.

From Mexico:

Chloridea obsoleta in tomatoes.
Chrysomphalus sp. and Formicid sp. on orchids.

From Oregon:

Epochra canadensis in gooseberries.
Scab and Rhizoctonia on potatoes.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	20
Fish boats inspected	1
Passengers arriving from fruit-fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	52,884
Fumigated	18½
Refused admittance	9½
Contraband destroyed	1
Total parcels horticultural imports for the month	52,913

Pests Intercepted.

From Ohio:

Lepidosaphes ulmi on lilacs.

From Pennsylvania:

Saissetia oleae, S. Hemisphaerica and *Pseudococcus* sp. on crotons.

From Texas:

Aleyrodes sp. on gardenias.

From Japan:

Thyridopteryx ephemeraeformis and undetermined lepidopterous larva on cedars.
Undetermined lepidoptera in rice straw used as packing.
Coccus hesperidum and *Pseudaonidia duplex* on mokkoku shrubs.

From Central America:

Pseudococcus sp. and *Aspidiotus cyanophylli* on bananas.

From Belgium:

Coccus hesperidum and *Aspidiotus britannicus* on bay trees.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	15
Fish boats inspected	38
Passengers arriving from fruit-fly ports	49

Horticultural imports:

	Parcels
Passed as free from pests	5,562
Fumigated	0
Refused admittance	6
Contraband destroyed	2
Total parcels horticultural imports for the month	7,570

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli on bananas.

From Southern States:

Undetermined larvæ in cotton seed.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	8
Passengers arriving from fruit-fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	9
Total parcels horticultural imports for the month	9

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Volume VIII Number 8

MONTHLY BULLETIN

OF THE

DEPARTMENT OF AGRICULTURE

STATE OF CALIFORNIA

Date Palm, Yolo County, California

III. PROCEEDINGS

OF THE

First Interstate Plant Quarantine Conference

RIVERSIDE, CALIFORNIA, MAY 26-27, 1919

HELD UNDER THE AUSPICES OF THE

State Commission of Horticulture

SACRAMENTO, CALIFORNIA AUGUST, 1919

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Plant Quarantine Conference

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AT

Riverside, California

MAY 26 - 27, 1919

SACRAMENTO, CALIFORNIA

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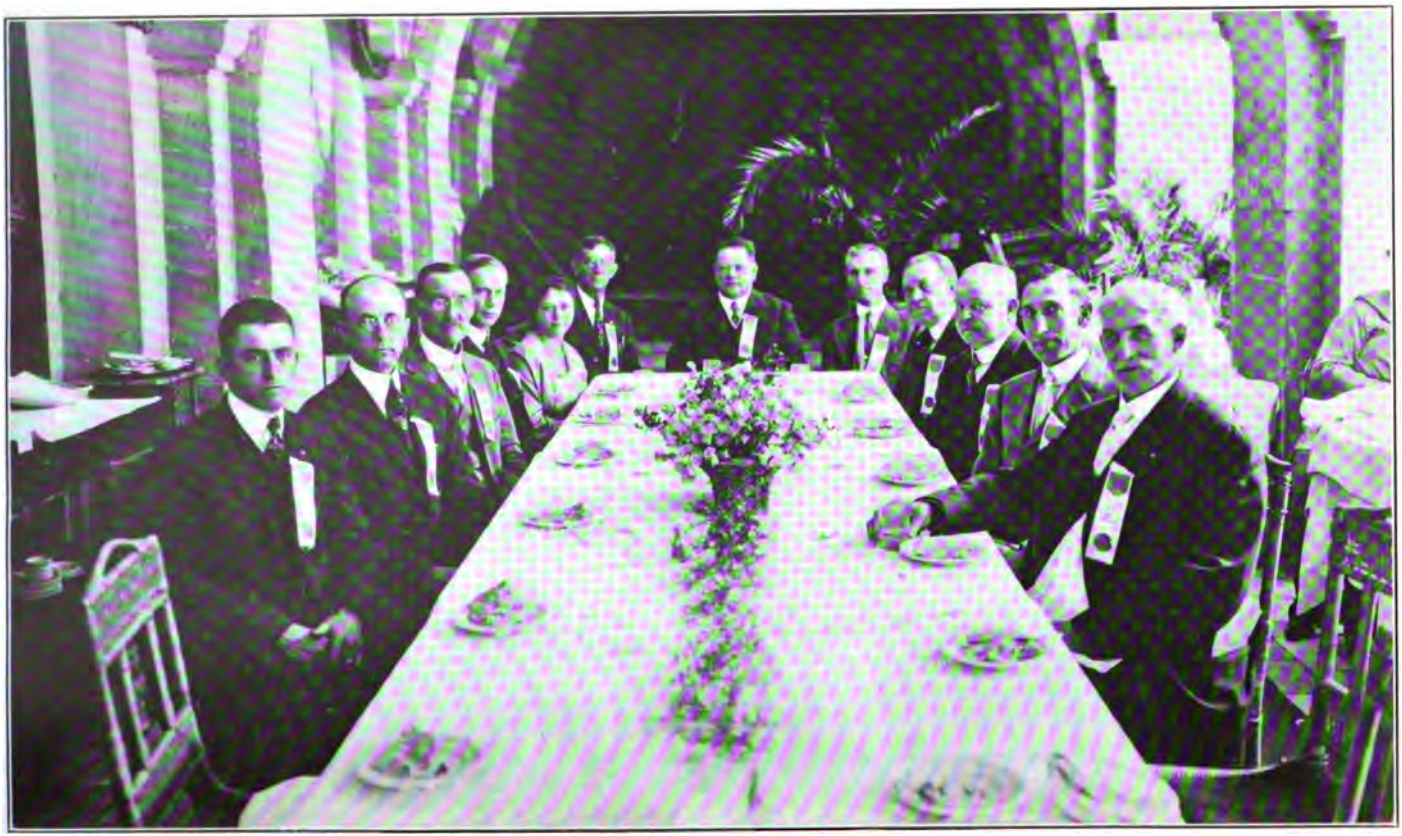

DELEGATES FIRST INTERSTATE PLANT QUARANTINE CONFERENCE.

Left to right: A. L. Strausz (Montana); Geo. M. List (Colorado); A. L. Kimball (Arizona); H. R. Hagan (Utah), the Secretary; Miss Leila Hecke (California), the Mascot; E. M. Ehrhorn (Hawaii); G. H. Hecke (California), the Chairman; W. H. Lyne (British Columbia); Chas. A. Park (Oregon); Frederick Maskew (California); W. H. Wicks (Idaho); M. L. Dean (Washington).

THE MONTHLY BULLETIN

DEPARTMENT OF AGRICULTURE

STATE OF CALIFORNIA

DEVOTED TO AGRICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

G. H. HECKE, Director.....Censor

BRONTE A. REYNOLDS, Assistant Secretary.....Editor

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CO-OPERATION SPELLS SUCCESS.

The First Interstate Plant Quarantine Conference was held at Riverside, California, May 26–27, 1919. This conference with others had been delayed for over a year due to the war and the epidemic of 1918, but when finally realized marked an accomplishment of unprecedented interest and enthusiasm. The great value of the findings and discussions at this convention can not be overstated, for they indicate the forward trend of ideas and events which is the index of advancement and betterment not only for our country west of the Mississippi but indeed for the United States in general.—G. H. H.

OBJECTS AND AIMS OF THE WESTERN PLANT QUARANTINE BOARD.

The wisdom and foresight which culminated in the formation of the national institution known as "The Federal Horticultural Board," for the protection of American plant industry, under the leadership of C. L. Marlatt, one of its first and ardent advocates, is rapidly shaping its course as an asset in the agricultural economy of the country at large.

It was but natural then, seeing the great benefits to accrue from such co-ordinated work, and based on the foundations prepared by our California quarantine and inspection in the past, that we of the Northwest and the Pacific states, in a measure geographically isolated, should seek the means to proceed along the lines of our many agricultural activities with due facility and safety to this end, and with the able assistance of representatives of our neighbor states, was created the "Western Plant Quarantine Board," for the efficient protection of our plant industries

against plant diseases and insect pests through the maintenance of adequate inspection in all of its manifold and varied aspects.

The pressing need for such an organization has long made itself apparent, and through its intervention it is hoped that the seemingly serious problems, which from time to time have arisen in the work, may, through closer understanding and the more intimate relations born of kindred desires and needs and a co-operative spirit, find a ready solution to the ultimate advancement of the interests of all of the states concerned, which heretofore had not been possible as individual states.

Upon the firm foundations of our honest convictions let us strive to attain that degree, not so much of perfection but rather of worthy merit, and in entering this era of better understanding realize fully that we are but building for those of our states represented by the Western Plant Quarantine Board who are destined to succeed us.

Any new and untried venture may be beset with numberless obstacles, but given the spirit to attain, all things are possible, and the strength imparted by organization will solve the problems heretofore deemed difficult for each, as individual states.—G. H. H.

THE RIVERSIDE CONVENTIONS.

The First Interstate Plant Quarantine Conference reported in these pages constituted an important part of the meetings held during "Convention Week," May 26–31, 1919.

The conferences were published as follows:

I. Proceedings of the First Interstate Vegetable Growers' Conference, May 26–27, 1919.

II. Proceedings of the Fifty-first Convention of Fruit Growers and Farmers, May 28–29, 1919.

III. Proceedings of the First Interstate Plant Quarantine Conference, May 26–27, 1919.

The reports of the Vegetable Growers and the Fifty-first Fruit Growers' and Farmers' Conventions were published as the June and July Monthly Bulletin of the State Commissioner of Horticulture, which office was superseded July 22, 1919, by the Department of Agriculture, with Commissioner Hecke as Director of the new organization. The first Interstate Plant Quarantine Conference is reported as the August Monthly Bulletin of the Department of Agriculture, State of California. (EDITOR'S NOTE.)

FROM ALL QUARTERS OF THE GLOBE.

Standing, from reader's left: W. H. Wicks, Idaho; O. A. Pratt, Mexico; Geo. P. Weldon, State Deputy Horticultural Commissioner, California; A. Pellegren, Mexico, who, with Mr. Pratt, represented the State of Lower California and its President Cantu; C. H. Vary, Deputy Quarantine Officer, California; Geo. M. List, Colorado; Harry S. Smith, State Insectary, California; W. A. Jacobsen, California Rodent Control; H. M. Armitage, Southern California Insectary; O. W. Newman, Northern California field deputy; Harold Hagan, Utah Quarantine Officer; S. C. Mason, Bureau of Plant Introduction, United States Department of Agriculture; Dean Thos. F. Hunt, University of California; and the last man, who almost escaped the camera, is Andrew Kimball, Arizona Plant Board. Seated, left to right: D. B. Mackie, Southern California field deputy; M. B. McKay, potato specialist, Corvallis, Oregon; E. M. Ehrhorn, entomology, Hawaii; A. L. Strausz, State Horticulturist, Montana; M. L. Dean, quarantine official, Olympia, Washington; Frederick Maskew, California State Quarantine Officer. (Courtesy "California Cultivator.")

THE MONTHLY BULLETIN

CALIFORNIA STATE DEPARTMENT OF AGRICULTURE

Vol. VIII. August, 1919 No. 8

FIRST INTERSTATE PLANT QUARANTINE CONFERENCE.

GLENWOOD MISSION INN,
Riverside, California.

The State Commissioner of Horticulture, Hon. G. H. Hecke, in the chair.

Meeting called to order at 10 a.m., Monday, May 26, 1919.

The First Interstate Plant Quarantine Conference of the western states was called to order by the Hon. G. H. Hecke, California State Commissioner of Horticulture, presiding pro tem.

The chairman welcomed the delegates and appointed Mr. M. L. Dean of Washington as temporary chairman, for the purpose of organization.

Mr. Hecke was nominated and unanimously elected chairman of the Interstate Plant Quarantine Conference.

The chairman asked for a roll call of the states represented, which showed those present to be:

State.	Representative.
Arizona	Andrew Kimball
California	G. H. Hecke
Colorado	G. M. List
Idaho	W. H. Wicks
Montana	A. L. Strausz
Nevada	
New Mexico (delegated by telegram)	G. H. Hecke
Oregon	Charles A. Park
Utah	H. R. Hagan
Washington	M. L. Dean
Wyoming	
Territory of Hawaii	E. M. Ehrhorn
Province of British Columbia	W. H. Lyne
Northern District of Lower California	
Federal Horticultural Board	C. L. Marlatt

Nominations were then opened for secretary. Mr. H. R. Hagan of Utah was nominated by Mr. Maskew. Nominations were closed on motion by Mr. Taylor and Mr. Hagan was elected secretary.

With this organization the program was continued as follows:

ADDRESS OF WELCOME AND STATEMENT OF PURPOSES OF INTERSTATE PLANT QUARANTINE CONFERENCE.

By G. H. HECKE, Sacramento, California.

It gives me great pleasure to preside at the opening session of this Interstate Plant Quarantine Conference, for I feel that here in Riverside during the next few days we are going to lay a firm foundation upon which to build in the future

a fabric of horticultural quarantines that shall be safe, sane and practical and devoted to the better protection of the plant industries of the West.

The word "quarantine" has become a very familiar one to all of us, so familiar in fact that I think sometimes we take it for granted as something that has always been and always will be. Quarantines, and the recognized rights of governing bodies to institute them, have been in existence in various forms and under many different conditions since 1448. With all the uses, however, to which this word has been put, it remained for the State of California first to enact a law containing the word "quarantine" applied to plants and plant products, and providing means to execute its provisions. This application of the word, which first appears on the statute books of California in 1881, opened up a new field and one which, as subsequent events have proved, is destined to occupy a very important position.

This first use of the word "quarantine" resulted in the creation of a state office authorized to draw up quarantine rules and regulations covering the transportation of horticultural material. The first result of the practical application of these rules and regulations was a decision branding them unconstitutional, handed down by the supreme court. From that time until the present the efforts on the part of the crop producers have been unceasing to secure laws to protect the plant industry against the introduction of injurious insects and diseases.

Most of the earlier steps in the development of plant quarantines, having no precedent for guidance, were necessarily cumbersome and lacking in effectiveness. Almost each succeeding session of the legislature, however, saw a step taken to tighten the quarantine law with which California was endeavoring to surround herself. The development of plant quarantines in more recent years has been exceedingly rapid until we find at the present time that every thinking man who comes in contact with the many complex problems connected with the plant industry is using the word "quarantine" as the solution of a great many difficulties.

The first national recognition of the value of plant quarantines given the state quarantine officers is found in the early post-office orders, affording a partial control of plants and plant products offered for transportation through the mails. The first big step of national importance was the passing by congress of the plant quarantine act creating the Federal Horticultural Board. The exercise of this great police power by the federal government gave an impetus and a prestige to horticultural quarantine work which had been lacking and which was sorely needed for the highest efficiency.

Many states have come to realize the necessity of protecting their plant industries by preventing the introduction of plant pests which would be liable to increase within their borders the cost of crop production, and we find that horticultural quarantines are coming into practical use in a great many states of the union. The costly experiences of Florida with the citrus canker and of Texas with the pink bollworm of cotton have greatly emphasized the possibilities of this type of insurance.

The western states represented here today have many interests in common. Throughout the territory which we have the honor to represent, the industries of horticulture and agriculture are coming rapidly to the front. Starting in as we have done with areas clean of many of the most injurious pests, there is the greatest incentive to use every possible means to retain this advantage over our neighbors. Bounded as we are on the east and south by the Rocky Mountains and the great desert, on the west by the Pacific Ocean, and on the north by the great snows, the eleven western states, together with our neighbors, British Columbia, on the north, and Lower California, on the south, occupy a position peculiarly fortunate with reference to the natural distribution of plant pests. The territory of Hawaii, because of its geographical situation, enjoys a similar advantage. It seems logical that we should endeavor within the territories thus protected from invasion by natural means to add to nature's barricades the man-made plant quarantines to prevent the introduction of these pests when carried by human agencies. Plant quarantines of one kind or another are already in effect in every state within this territory. The enforcement of these regulations is in the hands of experienced men, men who are familiar with the needs of the territories under their immediate supervision, and men who are thoroughly imbued with the necessity for the maintenance of the primary objects of their work. It but remains, therefore, to bring about the maximum protection for this territory, for these men to come together to learn each the problems of the other, and to form a working agreement which shall enable us to carry out the principles of plant quarantines for our individual as well as for our collective protection.

It is for this reason then, that, speaking for the State of California and for the people of this beautiful city of Riverside, I bid you welcome to this, the first Interstate Plant Quarantine Conference.

As a foundation for the work which we are hoping to perform, I would suggest that we should base our deliberations upon these three main points:

First—The horticultural quarantines now in force between the states represented;

Second—The question of how to devise and develop practical methods of executing the provisions of the same; and,

Third—The necessity of issuing and putting into execution uniform quarantines against other insect pests and plant diseases that constitute a common menace to our mutual horticultural and agricultural industries.

To further these three chief aims of our meeting at this time, it may develop that we should form a permanent organization for the purpose of considering any future regulations that may become necessary to protect the crops of our respective states from the introduction of new pests and of perfecting ways and means of checking the further distribution of such as have already become established.

THE FEDERAL PLANT QUARANTINE ACT.

By C. L. MARLATT, Chairman, Federal Horticultural Board, Washington, D. C.

Mr. Chairman, Ladies and Gentlemen: I have been asked to discuss the Federal Plant Quarantine Act. The illustrations and material which I intended to use in this discussion, which were sent ahead of me, have not arrived. I shall, therefore, make my discussion very informal.

In coming to California I feel that I am among friends and that the criticism which has been showered upon the Federal Horticultural Board for some of its recent actions is not materially supported in this state, which, as your Chairman has said, is the home of plant protection in America. We have always looked upon California as our teacher in quarantine work.

Most of you undoubtedly are familiar with the Federal Plant Quarantine Act and with the general features of its administration through a Federal Horticultural Board. This act was the outcome of a long, hard fight which began twenty years ago as a result of a nation-wide conference called like this one but meeting in Washington. This conference included state entomologists and inspectors and secretaries of agriculture and horticulture and other persons interested in plant protection. At the time that this conference was called California was the bright spot in our country from the standpoint of plant protection. California for many years had been giving herself protection, and incidentally protecting the whole United States, by an excellent port quarantine service, which has since been strengthened and which still maintains its rank as undoubtedly the best in this country. The need of a federal quarantine which should give similar protection to the whole United States had long been felt and was emphasized by the results which were being early shown, notably in the plant protection work being conducted in this state. The San Jose scale excitement of that period was, however, the leading element in bringing about the demand for a federal plant law. As a result of the conference in Washington a broad plant law was drafted which was intended to regulate both foreign importation of plants and also interstate traffic. On account of its breadth of field this proposed law aroused a good deal of opposition and failed to get any real standing before Congress. It was reintroduced at different sessions of Congress for a number of years but never received effective support.

In 1908 and 1909 the plant import situation became very serious on account of the sudden increase of infestation of nursery stock received from Europe and Japan by gipsy and browntail moths. This was about 8 years after the original attempt to get a federal plant quarantine law. The failure up to that time to get Congress to act had rather dispelled the enthusiasm of most of us and the passage of any satisfactory law through Congress was generally looked upon as being practically impossible. The securing of legislation, giving new federal powers, is always a difficult matter and especially so where such powers involve an entirely new subject of legislation encroaching in any degree on the police or other powers of the states.

In the face of the great danger which this country was under from the character of nursery stock importations of 1908-09 I secured permission from the Secretary

of Agriculture to draft a new plant quarantine law and to have it introduced in Congress. That draft was the original of the present plant quarantine act. It was a very difficult matter to get this legislation through Congress. The bill was revised and reintroduced many times before it was finally passed in August, 1912, and the story of the long fight to get this legislation would be a very interesting one if I had time to relate it.

The Federal Plant Quarantine Act of 1912 is limited to control of entry of foreign plants and plant products and to the establishment of domestic quarantines within the United States controlling interstate movement of such quarantined or restricted plants or plant products. As to its foreign features, all plants or plant products of whatever kind are subject to restriction. As to the domestic and interstate features, not only plants and plant products may be restricted but any other article which may be the means of conveying insect or disease enemies of plants, a control broad enough to cover, for example, stone and other quarry products, earth, or even manufactured articles. The law does not provide for any general interstate control of plant traffic except in relation to specific quarantines to prevent the spread of dangerous insects or plant diseases, and in this respect is less broad than the law drafted by the original conference at Washington referred to at the outset of this discussion.

This quarantine has now been in force seven years. There are now in force under it some fourteen foreign quarantines and seven orders restricting or regulating the entry of plants and plant products and some twelve domestic quarantines. With most of this quarantine and control action you are doubtless fairly familiar. I will discuss rather briefly a few of the more important activities of the Board in respect to these quarantines and restrictions on plant movement.

Perhaps the most important activity of the Board at the moment is in relation to the pink bollworm of cotton. This insect is a very important new enemy of cotton which has recently obtained foothold in Mexico and also scant foothold in Texas, and which I am expected to discuss more in detail on a later occasion. To prevent the further entry of this insect into the United States and to effect its control in the limited areas where it is now established we are now receiving from Congress an annual appropriation of upwards of half a million dollars. The work involved covers a very wide range, including extensive clean-up operations in Texas, the enforcement of a quarantine service between Mexico and the United States, the control of all import cotton into the United States and of the cotton mills in this country which make use of such import cotton, and also the control of cottonseed cake and meal and any other product relating to cotton which may be a means of introducing the insect.

Another important quarantine feature under the Board is the white pine blister rust quarantine, which has for its special object the protection of the great pine areas of the western half of the United States from infestation from the eastern half of the United States where this disease has gained wide and probably firm foothold. The citrus canker quarantine is also one which has a special interest for the people of California. One of the newest subjects of quarantine interest has relation to the European corn borer which has recently obtained foothold in the neighborhood of Boston and in a limited area near Albany, N. Y. We are asking Congress for an appropriation of $500,000 to exterminate this borer if such a thing is possible. Inasmuch as this insect is known to infest practically all succulent vegetation, even grasses, and is so concealed as to make its discovery difficult, its extermination is not going to be an easy matter; but if it can not be exterminated it certainly can be controlled. I do not believe in being unnecessarily alarmed over the introduction of any new pest, but in this case this insect has already demonstrated that it has very serious possibilities in relation to the future of the corn crop of America.

Another problem that has recently come up to the Board is the potato wart disease, one of the three plant enemies specifically mentioned in the Federal Quarantine Act to be immediately guarded against. This disease was evidently brought into this country in the winter and spring of 1911-12 before the quarantine act was passed. The Department of Agriculture through the Federal Horticultural Board is co-operating with the State of Pennsylvania in a thoroughgoing campaign to eradicate this pest.

These are a few of the important subjects which the Board now has under way. Other subjects are the oriental fruit or peach moth which came from Japan on ornamental cherry stock and has obtained rather wide foothold in the District of Columbia, Maryland and Virginia and also in New York and a few other

places. This pest might have come to this country on any shipment of Japanese ornamental cherry or peach stock, but apparently obtained its first foothold through a shipment of cherry trees made as a gift of the city of Tokio of Japan to the city of Washington. The first lot was of large sized trees and so seriously infested with various insects that the trees were burned. A second sending was later made of young trees and these were apparently in a fairly healthy condition and at least had been so pruned back that any evidences of the work of this insect had been entirely removed. Incidentally, it may be said that it is a very difficult matter to detect an insect about which you know nothing and which you are not anticipating. The inspector does not know where to look for it. In the case of this pest, even with full knowledge of its habits it is a very difficult insect to detect by inspection, so carefully concealed is it in its hibernating situation. This infestation was not discovered at the time and the trees were planted in Washington's Riverside Park. The local infestation of the District of Columbia and adjacent Maryland and Virginia has undoubtedly originated from this importation of flowering Japanese cherries. The incident illustrates the futility of inspection, even when carefully conducted, as a means of detecting unknown or unfamiliar pests and is one of the strong arguments for the more radical quarantine action which the Board has recently taken in respect to all such ornamental and nursery stock.

Another pest recently imported is the so-called Japanese beetle. It was introduced apparently about eight years ago on iris stock imported by the Dreer nurseries. It now has a very strong foothold in a comparatively small area in New Jersey opposite Philadelphia. This insect lives nine months of the year in the ground out of sight, is a strong flier, feeds miscellaneously on all sorts of vegetation, and there is therefore very little likelihood that it can ever be exterminated. By federal and state appropriation, however, a strong effort is being made to control this insect and to demonstrate the possibilities of exterminating it if such possibilities exist.

One of the last, and perhaps one of the worst, plant pests that has turned up in this country is the "take-all" disease of wheat which has recently been determined in a few fields in southern Illinois and in a similarly small area in Indiana. War conditions and food shortage led to a movement looking to the importation of wheat from Australia into the United States to replace American-grown wheat which was being exported to meet European needs. A knowledge of the risk from such Australian wheat led the Board to declare a federal quarantine and to place such restrictions as to disinfection and use of such wheat as to safeguard its entry. While these steps were in progress this disease was discovered in a small area in southern Illinois and later in a small area in Indiana. The method of entry of this disease is unknown and nothing has been found to indicate that it came with any wheat imported from Australia for commercial purposes. It is probable that its entry was due to some experimental importation of Australian wheat. Just before leaving Washington I signed commissions for a large number of inspectors to make surveys of the wheat areas of the United States to determine the possible introduction of this disease elsewhere. Very energetic action will be undertaken in co-operation with the two states concerned to stamp out the disease in the infected areas, including the prohibition of the further growth of wheat in such areas and the disinfection of the grain of this year and the burning of infected straw and stubble.

These seven or eight quarantine subjects which I have mentioned are the big items of work which the Federal Horticultural Board has under way at the present time.

I now wish to discuss the subject which has perhaps as great interest for you as any of these others and is one of the oldest of our lines of work. I refer to the nursery stock, seed and plant quarantine which has been administered since the passage of the act of 1912 but which has this year been revised under what is known as Quarantine No. 37. For seven years the Board has been endeavoring to prevent the entry of pests with imported nursery stock and other plants and seeds by a system of foreign inspection and certification with reinspection of imported goods at destination in this country. Under this system all foreign countries wishing to engage in plant traffic with the United States on a commercial scale have been required to establish an adequate inspection and certification service. Practically all of the important countries of the world have now established such service in response to the demands of the plant quarantine act of the United States. The benefit of this service, as evidenced in the character of the plant shipments to this country, has been tremendous. Whereas, before

these inspection and certification measures were compelled by our act, thousands of instances of browntail moth and gipsy moth infestations occurred in a single year in our plant imports, there are now comparatively few instances of these pests being found. Freedom from all kinds of insect pests and plant diseases has been very marked as compared with the old conditions, but, after all, it is only a *marked* improvement, not absolute freedom. These pests still come in. For example, sixty-three instances of browntail and gipsy moth infestations have been discovered by the inspection service in the seven years since the act went into effect, and it is unfortunately not at all certain that all infestations by these insects were discovered in reinspection at destination in this country. Hundreds of other pests have also been discovered as a result of these inspections. This state of affairs was the important reason leading to the enactment of a new nursery stock, plant and seed quarantine, namely Quarantine Order No. 37. Before this quarantine was promulgated the subject was given long and careful consideration. A thorough-going investigation was inaugurated by the Board, bringing into its scope all the departmental plant experts of its various bureaus. The matter had also been under consideration for several years by state men through their organizations. Finally the whole subject was discussed fully at a hearing at which the producing horticulturists and the state experts of the whole country were brought together. This discussion indicated a practically unanimous support of a quarantine which had been outlined and which was substantially the same in scope as Quarantine No. 37.

Following this hearing the matter was given further study by our experts and some of these experts visited producing horticultural establishments of this country to discuss the needs of this country as to plant importations. Some months later a final conference was called of all the interests concerned and to this conference was submitted a provisional draft of the quarantine. It was eight months after the quarantine had been first broached that it was finally promulgated. The action of the department and the board, therefore, can certainly not be charged with having been precipitant. This quarantine is effective the first of June, 1919. It has aroused a wide criticism and protest, much of this protest being based on misrepresentation. It has been represented, for example, that the quarantine will prevent the entry into the United States of new plant creations of Europe and other foreign countries and that America will be forever deprived of all such additions to its horticulture and floriculture. There is no foundation for this charge. The quarantine does not really prevent the importation of any plants into the United States for which a real need can be shown. Provision is made in the quarantine for the entry for introduction purposes of any new plant creations of Europe or other foreign countries. Furthermore, the quarantine provides for the entry of any reasonable amount of plant material not available in the United States which is needed for the development of reproduction enterprises to supply home needs. All such special introductions, however, must be made through the Department of Agriculture and will be subject to all the safeguards which the highly developed inspection service of the Department in Washington can give, including, if necessary, detention in quarantine or even the destruction of the imported material if its condition of infestation is such that such destruction is determined as necessary to prevent entry of pests or plant diseases. It is not probable, however, that material offered for entry under this provision of the quarantine will be often so infested as to require such drastic action. As a result of the misrepresentation referred to and other phases of misrepresentation Congress and the Department of Agriculture at Washington have been flooded with letters and petitions in opposition to the quarantine. This opposition has largely come from a misunderstanding of the quarantine or from certain importing interests which will be necessarily restricted in their business by the quarantine.

The experts of the Department of Agriculture, and I think also the thoughtful horticultural interests of the country, are convinced of the need of such quarantine action. Undoubtedly this quarantine will lead to a development in this country of horticultural productions to take the place of the articles which have hitherto been obtained from foreign sources. In this way it will indirectly be the means of developing American horticulture and floriculture. It is only fair to say to those who go into production enterprises to supply the material the importation of which has been cut off that this quarantine in all probability in its main lines will stand and that such enterprises will therefore fill a permanent place in our horticulture. This does not mean that Quarantine No. 37 is not subject to modification or change, but it does mean that the department and the

experts of the country are convinced that it is sound in principle and that its enforcement practically along its present lines will afford a needed protection for the forest, fruit and farm interests of this country. Wherever an error can be shown it will be corrected but changes will not be made for personal, selfish or commercial interests, however powerful their backing, to the loss of the principle of protection which underlies and is the basis for this quarantine.

In closing I wish to thank you for the attention you have given me and to express to you my great pleasure in being able to come out to California and meet you in the various conferences on plant matters which are to be held here in Riverside.

HORTICULTURAL QUARANTINE IN BRITISH COLUMBIA.

By W. H. Lyne, Vancouver, B. C.

Mr. Chairman, Ladies and Gentlemen—I appreciate very much indeed the privilege of attending this Conference as a representative of the Horticultural Quarantine Department of British Columbia.

The opportunity thus afforded those of us whose work is devoted to the control of insect pests and diseases affecting agricultural and horticultural interests is most valuable, and can not but help to broaden our conception of the work we are engaged in.

No doubt most of us realize it is one thing to make regulations, but entirely another thing to carry them out. And unless regulations are consistent enough to be practical, they had better not exist at all. By practical I mean that which is capable of resulting in good physical or moral effect.

Many federal, state or provincial departments have some excellent regulations, some dealing with specific local conditions and others of a general order, that would apply anywhere. The main problem is consistency and fair dealing.

BRITISH COLUMBIA'S QUARANTINE POLICY.

Although there were fruit trees planted in British Columbia in the early sixties, it was not until 1890 that sufficient interest was awakened to realize the possibility of fruit growing becoming an important industry throughout a large portion of the province.

BOARD OF HORTICULTURE APPOINTED.

In 1892, the provincial legislature passed a Horticultural Board Act, thereby creating the Board of Horticulture composed of men directly interested in the cultivation of fruit. These men and others of a kindred spirit, bore in mind their experience in older fruit sections, and starting out in a new country, it was their ambition to profit by that experience, and avoid as long as possible the insect pests and diseases that were such a handicap in other countries. The newly authorized board immediately framed regulations by which dangerous importations became subject to strict inspection and precautionary fumigation. A system of orchard inspection was started and certain penalties prescribed; and a program of educational work was arranged to suit the seasons of the year.

Naturally every detail of the present horticultural regulations was not thought out and put into operation at the start, various circumstances having been responsible for additions and amendments.

TWO SECTIONS OF QUARANTINE WORK.

We refer to our quarantine work as being divided into two sections, one dealing with inspection and treatment of importations, and the other with field work within the province.

IMPORTATIONS.

The importation of nursery stock and other horticultural products into British Columbia is governed by both dominion and provincial quarantine regulations that were formerly carried out by two sets of officials. In 1912, by mutual arrangement between the dominion and provincial governments, the provincial inspector assumed the responsibility of carrying out the dominion regulations in conjunction with those of the province in so far as they applied to importations entering Canada by way of British Columbia, thus doing away with the former duplication of service.

ROUTINE REGARDING NURSERY STOCK.

All nursery stock, trees, shrubs or plants entering British Columbia from any point outside that province, or imported into any part of Canada by way of British Columbia, must go direct to Vancouver for inspection and fumigation. Nursery stock may enter Canada by way of Vancouver from October 1 to May 1 only. The inspection and fumigating station at Vancouver remains open until June 1 to receive European and other stock consigned to British Columbia entering by way of eastern Canada. No trees or shrubs are allowed through the mail, but the ruling does not apply to greenhouse plants, herbaceous perennials or bulbs, which may be imported any time of the year subject to inspection but not fumigation.

TREATMENT OF STOCK AT FUMIGATING STATION.

Upon arrival at the Vancouver fumigating station, all trees and shrubs are carefully unpacked and placed in the fumigating chambers, where they are exposed to the fumes of hydrocyanic acid gas for forty-five minutes. Directly the gas has blown off, the stock is removed to the inspection room, where each individual tree or shrub is closely inspected. Anything found to be infested or infected with insect pest or disease of economic importance, is immediately discarded, and a tag denoting those condemned is placed in the box or parcel. Directly inspection is complete, the stock that has passed is carefully repacked with freshly moistened packing and the transportation company notified to forward it to its destination. A certificate of inspection is issued and attached to billing, also a condemnation certificate stating quantity and variety of stock condemned and reason for condemnation. Certified invoices must accompany all shipments.

FRUIT AND VEGETABLES.

All imported fruit and vegetables are inspected at or near the port of entry, quarantine officers being stationed at such points. No mercy whatever is shown shipments infested with such important pests as codling moth, San Jose scale, tuber moth, fruit fly, etc., which would be condemned wholesale and either destroyed or shipped out of the country by the most direct route. Special attention is also paid to empty cars that may contain the cocoons of codling moth.

All importations of stored products consisting of rice, corn, peas, beans, etc., are subject to inspection, and if infested with moth, weevil or beetle are either refused entry or fumigated with carbon bisulphide before being allowed to enter a warehouse. On certain occasions during the latter part of the war, shipments of rice and peanuts from the Orient were so large they were quite a problem to handle. Consequently only that badly infested was fumigated and the balance stored in isolated warehouses where it could be dealt with later.

Most of the pests in stored products from the Orient, such as rice weevil, plodia moth, etc., do not appear to survive a very low temperature and only flourish during the summer or when stored in warm warehouses in the winter season.

The pea and bean weevils of the Bruchus family are entirely another proposition and receive our very prompt attention by way of thorough fumigation.

FIELD WORK.

I have given you a rather crude illustration of our routine regarding importations, and will now attempt to give you some idea of our field quarantine work among the orchards and nurseries within the province.

In the year 1900 British Columbia was credited with about 8,000 acres planted to fruit, which in 1910 had increased to 33,000 acres, and at the present date is a little over 40,000 acres. These are divided into three districts, Coast, Okanogan or middle, and Kootenay or eastern. Horticulturists with assistant inspectors are stationed in each district whose duties consist of educational demonstration and patrol work. Also supervision and excution in dealing with any serious outbreak of insect pest or disease.

Nurseries are inspected twice during the year. Stock for sale is inspected at the time it is dug and heeled in ready for disposal. Nothing but perfectly clean, sound stock is allowed to be sold or distributed. Infested or infected stock is either destroyed or cleaned, according to the nature of infection.

In spite of energetic quarantine, we have had some orchard troubles to deal with. The fire blight epidemic of 1913 and 1914 in our Okanogan district gave

us an anxious time, until our growers were thoroughly educated to handle it, and the knowledge they now possess is an excellent insurance against further trouble.

We have also had a few incipient outbreaks of codling moth in certain small areas. In four of these the infestation has been absolutely exterminated and only two remain, with which we hope to have the same success. The percentage remaining in infested areas was less than one per cent.

I think I am correct in stating that throughout our 30,000 acres of apple and pear orchards only about 300 acres are involved in codling moth infestation.

If any San Jose scale still exists in British Columbia it is within an isolated area of about 200 acres, but would not be easy to find even there owing to the drastic method of treating it.

It is hard to say how long our system of quarantine in British Columbia will succeed in keeping us free from many of the most destructive pests, but while good results are in evidence, I think it would be very foolish to relax our vigilance.

THE CHAIRMAN: About a month ago a preliminary meeting was held in Portland, Oregon, on the white pine blister rust. I will now call on Dr. E. P. Meinecke for his report on this subject.

A BRIEF REPORT OF THE PROCEEDINGS AND RECOMMENDATIONS OF THE INTERNATIONAL WHITE PINE BLISTER RUST CONFERENCE HELD IN PORTLAND, OREGON, APRIL 23-24, 1919, UNDER THE AUSPICES OF THE ADVISORY BOARD OF AMERICAN PLANT PATHOLOGISTS.

By E. P. MEINECKE, San Francisco, California.

WHY THE CONFERENCE WAS CALLED.

The War Emergency Board of American Plant Pathologists in conference at Madison, Wisconsin, in June, 1918, while discussing various plant disease problems of continent-wide importance, was brought face to face with the fact that a grave menace threatened the great forests of the West, the seriousness of which was apparently not fully appreciated by the Western States and the Western Canadian provinces. The white pine blister rust crossing from Europe had invaded the white pine forests of the East, remaining there unheeded so long that it had become established beyond any possibility of eradication. A chance remained, however, that this disease might yet be prevented from spreading to the forests of susceptible western white pines and sugar pines beyond the Rocky Mountains, but the War Board realized that permanent protection for the West could only come when the states and provinces of the West, fully awakened to the danger, took concerted and vigorous action against it.

Although not a war emergency matter, it was nevertheless a matter of such great moment that the board decided to call the attention of the West to the situation. H. P. Barss of the Oregon Agricultural College, as commissioner for the West, was requested to take charge of this work. Letters were sent out widely. These met with an immediate and general response indicating an appreciation of the danger and a desire to see something done to ward it off. The western commissioner was asked to call a conference at which representatives of the various states and provinces interested might consider what measures were necessary to secure adequate protection against the blister rust and how the states and provinces could best co-operate to carry such measures into effect.

After unavoidable postponements, the white pine blister rust conference for the West was finally held at Portland, Oregon, April 23 and 24, 1919. The conference was conducted under the auspices of the Advisory Board of American Plant Pathologists, successor to the War Emergency Board, with the commissioner for the West, H. P. Barss, as chairman. This conference called together more than fifty representatives from British Columbia, Washington, Oregon, California, Montana, Idaho, Utah, Colorado and New Mexico, and from the federal governments of the United States and Canada, the first gathering of this kind ever held. The delegates included prominent representatives of the lumber interests of the West, of the United States and Canadian forest services, and of the state plant quarantine organizations. Some of the foremost investigators of forest diseases in America and a number of state and provincial plant pathologists were also

present. Thus the entire forest region of the western United States and Canada was well represented by men whose scientific knowledge and practical experience in forest protection and plant quarantine matters made them well qualified to consider the problems before the conference. Its recommendation should, therefore, carry especial weight and authority, and deserve serious consideration.

THE CONFERENCE.

The sessions of the first day were devoted to the presentation of information regarding the nature of the white pine blister rust, its geographic distribution, its damage to forests, the danger of its introduction into the West and the possible consequences. In addition, there was a discussion of the work already done in the East to check the progress of the disease, and of the government's extensive search for it in the West, where as yet no trace of its presence has been found. A summary of the existing quarantines against the pine blister rust in America and a discussion of the problem of effective quarantine enforcements were the most important features of the day's program. The principal speakers were Dr. Haven Metcalf, G. B. Posey, Ellsworth Bethel, W. A. McCubbin, Dr. E. P. Meinecke, Dr. W. H. Long, Dr. James R. Weir, J. W. Eastham, George A. Root, Frederick Maskew. Many others took part in the general discussions. The informal conference dinner was held in the evening, with Mr. Huntington Taylor presiding.

A general round table discussion of the measures that were believed necessary to secure effective protection of the West from the danger of pine blister rust invasion occupied the first session of the second day. Mr. Huntington Taylor, Dr. G. R. Hill, Dr. E. P. Meinecke, M. L. Dean, Frederick Maskew, D. Roy Cameron, W. A. McCubbin, C. F. Korstian and others took part. The existing situation was clearly set forth, the problems were analyzed and solutions suggested.

By vote of the conference, the chairman appointed the following three committees to draw up resolutions expressing the ideas of the conference, and to present them for discussion and adoption at the closing session:

Committee on quarantine and related matters—Dr. Meinecke, chairman; Dr. Hill, Mr. Maskew (representing Mr. G. H. Hecke), Mr. Cameron, Mr. Park.

Committee on quarantine machinery, endorsements and public education—Mr. Korstian, chairman; Dr. Heald, Mr. McCubbin, Mr. Hungerford, Mr. Hagan.

Committee on western plant protective organization—Mr. Dean, chairman; Dr. Weir, Mr. G. H. Rhodes, Mr. Eastham, Mr. Taylor.

These committees presented their reports at the closing session on the afternoon of the second day. After careful discussion of each item, the resolutions appearing below were unanimously adopted. Those present planning to attend the Riverside, California, Interstate Quarantine Conference, May 26–27, 1919, were appointed delegates to represent the Pine Blister Rust Conference. After a vote of thanks to those who had contributed time and effort to make the Pine Blister Rust Conference a success, final adjournment was taken.

Recommendations of the White Pine Blister Rust Conference.

(*Embodied in resolutions adopted by unanimous vote.*)

PREAMBLE.

The International White Pine Blister Rust Conference for Western North America, convened at Portland, Oregon, April 23–24, 1919, appreciates the serious menace to our timber resources of the disease known as White Pine Blister Rust, which is distributed by means of five-needle pines and currant and gooseberry bushes. It realizes with great apprehension that the disease is already widely established in the eastern part of this continent. In order to prevent its introduction into the West, it unanimously recommends consideration of the following precautionary measures:

RESOLUTION NO. 1. STATE QUARANTINE.

The White Pine Blister Rust Conference unanimously urges all states lying west of the line formed by the western boundaries of the states of Minnesota, Iowa, Missouri, Arkansas and Louisiana, hereinafter referred to as the "Mississippi Valley Line," to establish and enforce an effective quarantine which will

prevent the entrance into the respective states of all five-needle pines and all currant or gooseberry plants (Ribes and Grossularia) from all states east of the aforesaid Mississippi Valley Line.

The Conference further unanimously urges all states complying with the provisions of Section 1 to quarantine similarly against all states lying west of the Mississippi Valley Line which do not provide for the enforcement of an effective state quarantine as expressed in Section 1.

The Conference does not consider as an effective quarantine anything short of inspection and interception of all freight, express and parcel post shipments of plants quarantined against, by a competent legal agent of the state.

RESOLUTION No. 2. EMERGENCY FUNDS.

The Conference urges all states west of the Mississippi Valley line to provide for an emergency fund to be placed at the disposal of the proper state authorities in the case of a sudden outbreak of the white pine blister rust in their respective states.

RESOLUTION No. 3. NONACCEPTANCE OF PROHIBITED PLANTS BY SHIPPING AGENTS.

The Conference unanimously requests the Federal Horticultural Board to use its best endeavors to obtain from the United States Railroad Administration an order to the forwarding agents of all railroad stations located at points within the area covered by the U. S. Notice of Quarantine No. 26, warning them not to accept for shipment any five-needle pines or currant or gooseberry plants consigned to points outside that area. It also recommends that the widest publicity be given to this order at all railroad stations and express offices.

RESOLUTION No. 4. DECLARATION OF ARRIVAL OF PRESCRIBED PLANTS.

The Conference also considers it as very urgent that states make regulations requiring under penalty that any person, firm or corporation bringing five-needle pines or currant or gooseberry plants into their respective states from any source whatever and in whatever manner shall hold the same for inspection and report their arrival immediately to the proper state authorities.

RESOLUTION No. 5. STATE CO-OPERATION WITH FEDERAL GOVERNMENT.

Realizing the excellent results of co-operation of the Eastern States with the U. S. Department of Agriculture on a dollar for dollar basis, in the fight against the white pine blister rust, the Conference recommends that those states west of the Mississippi Valley line financially most interested in keeping the disease out of their forests enter into similar co-operative agreements with the U. S. Department of Agriculture.

RESOLUTION No. 6. CANADIAN CO-OPERATION.

Inasmuch as the Conference is convinced that no quarantine regulations adopted in the United States can be fully effective unless similar measures are put into effect in Canada, it unanimously recommends that measures analogous to those suggested in Resolutions Nos. 1 to 5 be adopted by the Provinces and the Dominion of Canada, as far as is compatible with their domestic conditions.

RESOLUTION No. 7. PROVISION FOR PROMPT ENFORCEMENT OF PROTECTIVE MEASURES.

The Conference unanimously urges that in order to be enabled to deal immediately and effectively with sudden or unexpected outbreaks of the white pine blister rust, each state and province provide laws, funds and machinery for the prompt establishment of intrastate quarantines and for control and eradication measures to deal with outbreaks within the state or province.

The Conference urges further that each state and province likewise provide laws permitting the proper authorities to establish immediately and without special action of the legislature a quarantine against any state or province not already quarantined against in which the disease may appear.

RESOLUTION No. 8. ENDORSEMENT OF CANADA'S EFFORTS.

The Conference desires to express its endorsement of the steps taken by the Canadian Department of Agriculture for the protection of the white pines of the Pacific Coast from the blister rust by establishing a quarantine protecting Alberta and British Columbia from shipments of white pine and Ribes from the East. It further urges that this department continue active efforts towards the protection of the western white pine areas from this disease.

RESOLUTION NO. 9. ENDORSEMENT OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

The Conference heartily endorses the work of the Office of Forest Pathology of the U. S. Department of Agriculture in the organized inspection for white pine blister rust and in its efforts in protecting the priceless forests of the West from invasion by this destructive parasite. It further urges that such financial support be given the federal department as will make it possible to continue active efforts in the protection of our western white and sugar pine forests.

RESOLUTION NO. 10. A WESTERN PLANT PROTECTIVE ORGANIZATION PROPOSED.

It is the unanimous opinion of the White Pine Blister Rust Conference for the West that there should be established in Western America a plant protective organization whose objects shall be to inform the public concerning dangerous plant pests and *to secure measures for their control,* and that the membership of this organization should include representatives of the agricultural, horticultural, timber and nursery interests, plant quarantine officers, plant pathologists, entomologists, foresters and others interested in the suppression of plant pests in the states and provinces of the West. It is further the opinion of the Conference that such an organization should work in the closest co-operation with the American Plant Pest Committee.

The Conference respectfully requests Mr. G. H. Hecke, Commissioner of Horticulture of the State of California, in his call for representatives to participate in the Western Plant Quarantine Conference to be held at Riverside, California, May 26-31, 1919, to include also a call for representatives of the industries and professions enumerated above to meet at the same time and place to consider the advisability of forming a western plant protective organization.

This Conference directs that a copy of this resolution be transmitted to Commissioner Hecke.

THE CHAIRMAN: *Gentlemen*—These are the resolutions, and now if the reasoning has seemed sound to you as to logic, if you realize that every single step we have taken is entirely in co-operation with every step you will have to take, I bespeak your hearty support for the aims and the resolutions of the conference I have just reported to you. The time has passed, in my mind, when each generation of Americans looked out for themselves, not thinking of their children. The time has come, I fervently hope, when we in America are beginning to think in terms of the future; that is, in terms of today's relation to the future.

QUARANTINES, THEIR PURPOSE AND HOW THEY MAY BEST BE IMPOSED AND ENFORCED.

By FREDERICK MASKEW, San Francisco, California.

Gentlemen—When a copy of the program of this Conference was sent to me and I read the title of the subject upon which I was required to prepare an address, it appeared that this number of the program was intended to be very largely, if not entirely, a formality—something to start a discussion—and being of that opinion I have endeavored to make the formality a brief one, so that we may reach as quickly as possible those discussions and ultimate consultations from which the real benefit will be derived.

PURPOSE OF QUARANTINE.

Dividing the title on the program into its subheads and dealing with the same in sequence, I feel satisfied that the members of this assemblage, all of whom are horticultural officers, know just as clearly now, as they would if I spent an hour struggling to elaborate, the real purpose of a quarantine. This purpose is the same—it has not changed since 1448, when the two-score or forty-day period of detention of ships and men was designated by the quaint old term of *quarantine,* and a code of laws drawn up to authorize its enforcement. The scope of application of the principles involved has been broadened to meet new requirements, but the same simple, fundamental purpose remains as of yore, namely, the prevention of the spread of disease.

From the general application of quarantine principles we may, considering the object of this meeting, state more specifically that horticultural quarantines have for their purpose the prevention of any further increase in the cost of crop production, that might otherwise result from the introduction of new and dangerous insect pests and plant diseases. To prevent any further increase in the cost of crop production is a worthy purpose, and so long as it remains and is maintained as paramount in imposing and executing horticultural quarantines, to the complete exclusion of any situations or suggestions of commercial expediency, so long will such regulations be respected and upheld.

IMPOSING A QUARANTINE.

It is a very serious matter indeed to impose a horticultural quarantine against a country, a state, or even a small local area. The ultimate effects of such an order are multiplex and far reaching; once issued, its provisions will concern directly or indirectly not alone the particular crop itself, but all phases of industry connected with the prohibited plant product, and such drastic action should not be resorted to until all other known means of protection have been proven inadequate. Before undertaking the act of imposing a horticultural quarantine, it is well to be sure that the authority granted to perform such an act is full and complete, and will stand the test of the courts. Very rarely, if ever, does a quarantine order become a popular measure. Many persons, besides the actual producers of the crop protected, will eventually become interested—often much more—in the effects produced by the quarantine order, and such interest is not always directed toward a full maintenance of the provisions of the order or appreciation of the efforts of those who are endeavoring to enforce the same. So that if the foundation is not properly laid, subsequent superstructures will constantly be in jeopardy, even in the state in which they are erected, and those charged with the enforcement of the order will never be sure of their position in this matter. Further, authority should not be asked or granted until ample provision has been made for the prompt execution of all regulations made under such authority.

The issuance of a horticultural quarantine order should be preceded by a thorough study of the problem involved. All the facts connected with the situation, both those of the opposition (for there is sure to be some opposition) as well as those of your own viewpoint, should be clearly established, properly digested and well ventilated at a public hearing before final action is taken and the quarantine imposed. In drafting the provisions of a horticultural quarantine order the equity of every phase of the contemplated situation should be given full consideration. Such thought and action at that time will obviate a multitude of difficulties later on. Restricted material will arrive despite the quarantine order, and there will be a property right involved therein which should be clearly recognized and provided for if subsequently you expect the courts to support your actions in connection with the same. In view of this fact the text of the order should be just as clear on the method to be employed in disposing of this material when intercepted as it is in stating that the same is prohibited. Another apparently insignificant yet important point in the preparation of the quarantine order is the language used in expressing the nature of the regulations. It is usually a long distance from the docks or railroad depots to the district attorney's office. Protection to the plant industry often hinges upon the authority to act quickly, and, considering that these regulations will ultimately concern all classes of people the terminology employed in setting forth the same should be plain, positive and definite, well within the easy comprehension of all classes of people and devoid of all ambiguity that might require legal interpretation, and thus cause delay.

ENFORCING A QUARANTINE.

The final test of the value of any law is the ability to successfully execute all of its provisions, and a quarantine can best be enforced by a force of inspectors sufficient in numbers to cover the delivery points of all trade channels available to the transportation of the class of material under restriction. The provisions of a horticultural quarantine order may prohibit, but, by the simple virtue of their existence they do not entirely prevent. The penal code prohibits the act of committing murder and theft and arson, but it does not entirely prevent the same. Prevention takes place when an officer, armed with authority, steps in and stops the attempt to violate the provisions of the law. Preventing the act of violation is perhaps equally necessary in executing horticultural quarantine regulations for,

if not prevented, the evil results that ensue are not confined to the individual violator, but are ultimately destined to affect the welfare of the entire community. A quarantine is not complete if a single parcel of the quarantined material succeeds in passing through the quarantine lines. One lot of material infested with fruit fly or pink bollworm larvæ that should slip through and reach a suitable environment, would promptly undo the accumulated results of all the efforts of previous years. Failure to enforce a law—quarantine or otherwise—soon brings the same into public ridicule, and ridicule is fatal to the achievement of complete success in any endeavor. The presence of an officer is essential to complete enforcement, and as the gift of omnipresence has not yet been vouchsafed to quarantine inspectors, the issuance of horticultural quarantines should always be accompanied by the appointment of sufficient quarantine officers to enforce the regulations at all points of delivery.

There are other essential factors, besides numerical strength, to be taken into consideration in providing a force of inspectors to enforce the provisions of a quarantine order, one of which is the temperament of the men selected for the purpose. No other part of the quarantine system comes into as close contact with the public as that of the inspector. He is the visible quarantine law to the tourist and mercantile world—the first line of defense in the protection of our plant industry—and as such, comes into intercourse with individuals representing a wide range of business and social life, and their respect for the integrity and intelligence of the quarantine service is measured in a large degree by their association with the inspectors. Strong public sentiment in favor of any law is the first essential toward successful execution of the provisions of the same, and an inspector who is gifted with a temperament that enables him to handle owners and agents, search baggage and freight with tact, courtesy and dispatch, and at the same time reject prohibited material with firmness and quiet determination, has laid a good foundation for strong public sentiment in favor of quarantine regulations.

In executing the provisions of a horticultural quarantine order the service of an inspector is often performed under conditions which render close supervision impossible. This creates a situation where his belief in the value and purpose of the work entrusted to him should and must take precedence of such things as the clock, the calendar or circumstances, if the law is to be enforced and a quarantine maintained. Persistence in searching is the most vital part of his duties; the last package on the dock, the last sack in the car, may be the one containing contraband, and when an inspector's bump of curiosity is so abnormally developed as to cause him to be obsessed with the idea that he can tell much better what is inside a box or a sack after he has opened the same, he can rest assured that he has found his proper place in the work of the world, and that the same is appreciated at headquarters.

Securing the co-operation of the common carriers is an important factor in executing quarantine regulations. To obtain such co-operation is the function of the one in charge of the quarantine work. It is a fact that the average working man pays a great deal more attention to the orders of those who pay his wages than he does to the language of the statutes. With this fact established the one responsible for and interested in maintaining a horticultural quarantine should go to the executive head of the transportation company concerned, and solicit the issuance of a general order to the company's employees to obey certain regulations. If he succeeds in getting such an order issued he can rely upon the employees promptly interesting themselves in finding out what such particular regulations are. There will be no difficulty in obtaining such an order if the situation is properly presented. One of the results of maintaining a horticultural quarantine is larger crops of cleaner produce as a result of keeping out insect pests and diseases. Larger crops mean more freight. Show transportation companies how to obtain more freight and they are yours for co-operation; at least, that has been my experience.

Maintaining a working co-operation between the agents of the common carriers and the officers of the quarantine service is a continuous problem for the inspector. Co-operation implies reciprocity, and if the quarantine inspector expects to receive a full measure of the same he must be prepared to give a like amount in return. It is just as essential that he study diligently how best he can make the required inspections, with the least interference to the routine work of the depot agent, as it is to expect the depot agent to set aside in the rush of delivery all such parcels as require inspection. Interest breeds interest, and it is invariably true that when the agent finds the inspector interested in the principles that make for dispatch in

delivery, he becomes interested in the causes that make inspection necessary. When this condition obtains, a fuller comprehension of the importance of their dual duties ensues, and the result is team work—the first step toward maintaining a complete quarantine.

Another factor in this problem of co-operation is the educational one. Inspectors should be fully alive to their obligations in the matter of educating all persons with whom they deal in the requirements of the horticultural statutes. It is not sufficient that they seek advice from the agents as to changes in routes and time schedules. They should give advice as to new, or changes in old quarantine regulations. New men are constantly being installed at delivery points, and what to the quarantine inspector is the main issue, is often but a side issue in the complex traffic problems that confront the new agent. At such times a clear and kindly explanation of quarantine regulations is not only good business, but an economic necessity. This principle of co-operation should extend all down the line of operation. It applies equally to our dealings with postmasters, with passengers, with nurserymen, with consignors and consignees, of all types and classes. It is to the successful consummation of quarantine regulations what a sound law is to their foundation, and it should be the major chord that dominates the rhythm of the quarantine inspector's daily actions, if he expects to replace the general feeling of repugnance with a wholesome respect for the quarantine law.

MR. M. L. DEAN (Washington): *Mr. Chairman, Ladies and Gentlemen*—Mr. Maskew has finely presented the main point of quarantine as I see it, that of construction rather than destruction. I believe that generally a quarantine regulation is looked upon as a means of destruction, which is just the contrary to what it is.

The economic side of the question, which the speaker brought out so clearly, should stand foremost in every quarantine enforced. The economic loss of shipments that fail to pass our inspections, the cost of inspections and every enforcement of legislation affecting production should be carefully considered. Public hearings, as set forth in the paper, give everybody the chance to present his side in arbitration which is above criticism.

Co-operation we must have, as outlined by Mr. Maskew, and getting the hearty sympathy and support of the transportation companies and other interests, is what we might call true co-operation. I believe that Mr. Maskew has this worked out to a point that covers all the necessities. I have never listened to so clear a discussion and many points have never before been so simply and definitely set forth.

I feel that I have received a valuable lesson in listening to Mr. Maskew.

MR. W. H. LYNE (British Columbia): *Mr. Chairman, Ladies and Gentlemen*—We wish nothing more than the most hearty co-operation between the United States and Canada. I speak for both the provincial and the federal quarantine work in British Columbia and Canada. We realize that only by hearty co-operation can we get real results producing that moral effect from which we hope to get the best results.

Mr. Maskew and also Mr. Dean in their reviews of the whole problem of quarantine, show that they have had exactly the same experiences that I have myself, and I can most heartily sympathize with them and the conditions they have to deal with. Fair administration is a most important item, for given good laws without fair administration, the work of quarantine will never proceed smoothly and uniformly; and without some kind of uniformity it is pretty hard to get results and to secure the co-operation of those who should be interested. Quarantine work is not to handicap the horticultural and the agricultural industries,

but to assist their production. I think all systems of law are based on that ideal.

Mr. Maskew also mentioned port application of regulations. This is a thing that we have always tried to carry out in British Columbia. We found that, in connection with nursery stock, having one port of entry with one well equipped receiving station, where everything could be handled with the utmost dispatch and thoroughness, we could add a great deal to the problem of dispatch; where, did we have to run all over the country to points at a distance to inspect importations, it would require a whole army of inspectors and in many cases it would be hard to say just how effectively the work would be carried on.

There is another thing, the danger of concession. One of the most disagreeable parts of a quarantine officer's duties is, I think, that of, from time to time, having to make peculiar concessions; that is, departing somewhat from the hard and fast ruling of the regulations, in order to meet some extenuating circumstances. The danger is that some particular concessions may be warranted under the circumstances, but may be taken as a precedent for future occurrences of somewhat similar nature, which may not be justified. At the same time, you are liable to raise jealousies and charges of severity from the parties interested.

Nothing so undermines the influence and authority of the quarantine department as not to be able to carry out a regulation consistently and effectively.

Another thing that appealed to me in Mr. Maskew's remarks was sympathetic administration on the part of inspectors. Perhaps I should say, natural courtesy. I think all of you know how far natural courtesy goes in any administration. Everyone hates a bumptious official. If one can enlist the sympathy and understanding of the party with whom one has to deal one often succeeds in bringing people to his way of thinking.

THE CHAIRMAN: Dr. Morrill of Arizona is ill and his paper will be read.

(*Secretary reads Dr. Morrill's paper.*)

WHAT CONSTITUTES GROUNDS FOR REJECTION OF NURSERY STOCK.

By A. W. MORRILL, Phoenix, Arizona.

This subject is obviously intended to be distinct from the matter of quarantines. Nursery stock or plants against which quarantines are maintained for any reason are outside the jurisdiction of the plant inspector. Without consideration of the matter of quarantines, therefore, all nursery stock or other plants which appear to be absolutely free from insect pests or plant diseases should of course be certified or released as the case may be. This does not mean that plants in an infested or infected lot which individually may appear to be clean should be so declared and passed by the inspector. The statement refers to trees or plants of any one kind found in a shipment or in any one lot which may be inspected.

The question of what constitutes an infested or infected condition is one which it is difficult to answer and in fact it is impossible to answer this question to the satisfaction of all persons concerned, in a great many instances. Among the considerations involved in the question are distribution of the species of insect or disease-producing organism, past history of the pest, relationships of the pest, host plants subject to attack, condition of the pests in the case of insects at the time of inspection and practicability of eradicating the pests as an alternative to rejection.

CONSIDERATIONS RELATED TO THE DISTRIBUTION OF THE SPECIES.

In connection with all of the foregoing considerations it may be accepted as an invariable rule that no trees or plants should be certified to as free from pests or released as long as live insect pests or evidence of fungus or bacterial disease exists. In connection with the distribution of pests the writer believes that the existence and general distribution of a pest in the locality in which a plant shipment is received is ground for considering the practicability of eradication. There are some cases when this is not practicable and in such cases the infested shipment should be condemned. As an example, a shipment may be consigned to a retailer, infested with a pest which is of common occurrence in the immediate locality where the consignee carries on his business. The retailer, however, may be doing business over a wide territory and if stock, for example, infested with the destructive scale insect were released to him after fumigation or dipping in an insecticide it would be practically certain that sooner or later this scale would be sent by this dealer and established in many localities where it did not previously exist. The final answer to considerations related to the distribution of a pest must necessarily follow a rule established for the locality or be left to the judgment of the inspector.

PAST HISTORY.

There are from time to time occasions when the past history of an insect or of a disease-producing organism may be given consideration in deciding as to what constitutes a pest under given conditions. In general, however, it must be regarded as extremely dangerous to assume that an insect with notoriously bad relationships is harmless even if it has never been known to do damage to cultivated plants. The writer can not recall in his personal experience any instance where considerations of this kind should be given any weight in passing upon nursery stock, but by way of illustration we will suppose that somewhere in the State of California there is a citrus growing district where the cottony cushion scale does not exist in that district. In consideration of the fact that the cottony cushion scale is being controlled with marked success in surrounding districts, an inspector might reasonably be lenient to the extent of disregarding a few dead specimens of this species of scale, whereas, in a citrus growing district in the state of Arizona, far from any known occurrence of the cottony cushion scale, an inspector would not be justified in considering the history and present degree of control by natural enemies in districts where the pest is established.

RELATIONSHIPS.

In the case of insects which are not recognized by the inspector the relationships of the insect or disease-producing organism is an important factor in determining the status of the infestation or infection. All species of scale insects and of aphids or plant lice can reasonably be considered as potential pests. Among the thrips there are some species which, as far as known, are predaceous in their habits. I have in mind one species of thrips which destroys the immature stages of the citrus white fly in Florida. Such instances among the thrips are rare and an inspector can safely assume that whenever thrips are found breeding upon a plant the species is or may be destructive. Among the Aleurodids or white flies there are many species which are apparently insignificant, but since several of this group have already become notable pests they must all be regarded with suspicion. Fortunately white flies are not known to reach maturity on trees or shrubs except when established on the leaves. It, therefore, becomes practicable in many cases to eradicate white flies from trees or shrubs by removing and burning the leaves. Weevils and all boring insects found infesting cultivated plants of any kind must be regarded as pests. Frequent misunderstandings occur on the part of shippers who do not realize that there are hundreds of different species of scale insects, plant lice, white flies, thrips and other injurious groups. A locality may have established fifty different species of plant lice, but the inspector is compelled to realize that among those not already existing in the locality there are many just as injurious as any of the established species and perhaps far more so.

HOST PLANTS.

In some cases where insect pests have been known to confine their attacks to one or two relatively unimportant host plants, consideration may be given to this factor. As an example may be mentioned the common arbor vitæ plant louse,

The remoteness of the possibility of this insect becoming a pest of fruit trees is a matter which can reasonably be given consideration in conjunction with the question of its local distribution and of the practicability of eradicating it from the infested plants.

CONDITION.

An inspector frequently is called upon to inspect plants to which dead specimens of insect pests are attached. In such cases there is frequently difficulty in classifying the plants as either clean or infested. A more or less arbitrary rule must be followed in such cases. If an error is to be made it should be on the side of condemning such plants rather than of certifying or releasing plants on which a few live individual insects might be overlooked among a large number of dead ones. The inspector's judgment must be relied upon to a large extent to protect against the spread of the pests on one hand and on the other hand to avoid injustice to the owner or shipper. As an example of the condition here referred to, we may consider the case of a shipment of pepper trees on one of which may be found two or three specimens of old black scales which evidently have been dead for several weeks and perhaps months with no evidence of recent infestation resulting from a most careful examination. In such a case the inspector would be justified in rubbing off the two or three dead specimens of scales and considering the pepper trees thereafter as clean as a similar lot upon which no trace of scales, living or dead, can be found. When, however, there is a general infestation of plants in a shipment with scale insects no certificate and no examination within the bounds of reason should be considered as sufficient to warrant the certification or release of such plants. Only one kind of inspection could possibly determine the condition of the insects in such a case. Such an examination would require the removal from the plants of every individual specimen of scale which in itself, if practicable, would remove all suspicion of infestation and leave no objection to the issuance of clearance papers by the inspector. All who are familiar with results of fumigating living plants know that it is rare that one can secure convincing evidence of 100 per cent results except by the method suggested whereby each individual insect is given a special examination.

PRACTICABILITY OF ERADICATION.

The practicability of attempting to eradicate pests upon nursery stock or other plants before such plants are shipped and after they are received at destination, are quite distinct questions. As a general rule, plants should not be shipped immediately after treatment to eradicate it. And no shipment should include plants known to be infested with living insects with the expectation that treatment will be given at destination, except under special circumstances.

At destination the practicability of eradication depends first upon the consistency with established rules, and second, upon the numerous considerations which have been discussed, such as history, distribution and relationships. It is first of all of prime importance that consistent rules be maintained by inspectors in regard to the treatment of nursery stock examined by the inspection service if it is to be an effective one in protecting against the unnecessary spread of pests. The inspector who does his duty must follow general principles with the least possible deviation, and exceptions to the general rule should be made only where no appreciable risks are involved.

The foregoing discussion is altogether inadequate for any complete consideration of this important question. A volume might be written on the subject. It is desirable, the writer believes, for a general plan to be worked out among inspection officials in conjunction with nurserymen and florists which can be used as a basis for arriving at inspection practices in different states and localities which are consistent and just. Probably no head inspection official would contend that the system in use in his own state is one which is absolutely faultless. Even in those states where the most progress has been made in working out inspection problems the state inspection service would doubtless be greatly improved by the work of an interstate standing committee on uniform inspection practices. It is not to be expected that any system can be worked out in detail which will apply in all states or even in all parts of any one state, but the adoption of general practices such as suggested would unquestionably prove of the greatest benefit to all persons concerned in the interstate shipments of plants.

MR. E. M. EHRHORN (Hawaiian Islands): In our work, any plant, any seed, any fruit, which is infested with any pest, insect, or fungus, is destroyed immediately upon arriving. We don't argue the question with anybody, but any material, which would threaten our industries, is at once condemned and destroyed.

I believe in the two points, co-operation and tact. Any official who is supposed to carry out the laws of any state or territory must have a great deal of common sense and a great deal of tact, if he wants to get along.

However, there is one point I want to emphasize most and that is the lack of equipment which I find in various sections of the country. We have our quarantine officers and have good men working for us, but we do not give them the equipment they should have for the work.

I have one scientific laboratory equipped with the latest microscopes and all material needed in a laboratory, gas, electric light, and everything in that line needed in a large plant laboratory. We have sterilizers, and an incinerator, which is heated by an oil blast in fifteen minutes to 2,000 degrees Fahrenheit.

Hawaii has appropriated $5,000 to equip its quarantine house. Recently, $3,000 has been appropriated for the port of Hilo, the only other port where direct shipments go from the mainland to Hawaii.

MR. A. L. STRAUSZ (Montana): *Ladies and Gentlemen*—I do not know if you people are very familiar with Montana. We do not grow as much fruit as you do in California. We do not have nearly the fruit interests that many other of the Western states have, but we desire to grow fruit. We grow the deciduous fruits very well in some localities, especially in western Montana, and the nursery business in Montana has always been given great consideration by the Montana State Board of Horticulture, which I represent at this meeting.

I was very much interested in listening to the quarantine discussion this afternoon. We have not the problems which the states possessing ports have, but we do have problems, and we have inaugurated a few quarantines, among them a limited quarantine on account of the alfalfa weevil, a quarantine which will be discussed tomorrow.

We have made a quarantine on the barberry and also on currant and gooseberry bushes, in connection with the white pine blister rust. We are doing the best we can to enforce these quarantines, and are getting some results. Our inspection force is entirely under state supervision.

What constitutes the proper grounds for the rejection of nursery stock is a question that I think was very well answered by the gentleman from Hawaii. If there is anything wrong with the plant, reject it, and that is just the policy we are following in Montana. The reason for inspection is to protect our plant industries—that is the fundamental reason. Another reason, which is of great importance, is that every grower of fruit or other products, is entitled to start his project with a clean spread, and if we have nursery stock coming into the state, which in any way endangers the plant industry of that state, it should be condemned and destroyed, or returned to the point of production.

Another reason for rejection would be the physical condition of the stock, which would indicate that it had been injured by low temperatures or any other untoward condition that had put the plant into a state of low vitality.

MR. J. B. HICKMAN: Mr Strausz has given my views. Every fruit grower has a right to start with a clean spread.

MR. FREDERICK MASKEW: This idea reaches into the community. When a man plants a tree or an orchard, it is something that concerns not only himself, but his neighbors. If it is clean, it will probably be a source of revenue and pleasure to him; if not, it will be a menace to others. It is something broader than the man.

MR. M. B. MACKAY (Corvallis, Oregon): I would like to enlarge upon the element of popular education on these subjects. A great many people do not seem to think it important to talk matters over with the people with whom they have to deal.

MR. H. R. HAGAN (Utah): Mr. Ehrhorn brought out a point that I believe needs more attention and will receive it in the future. I am referring to the soil surrounding importations of plants. There are more dangerous animals in that soil. I mean nematodes: the trichina of the pig; the roundworm of the horse; the rootknot nematode causing galls on something like two or three hundred plants; the nematodes of beans, grass, etc., are all examples of this group of animals.

When nematology has progressed as far as entomology has now, we shall know that many poor yields are due to nematodes which we, at the present time, know nothing about. The widest field in zoology at the present time is the study of the nematode. The soil in plant shipments should be destroyed just as the plant is destroyed.

QUARANTINES AGAINST "FLAG SMUT" AND "TAKE-ALL."

By W. W. MACKIE, Berkeley, California.

We have hardly recovered from the fright which our shortage of wheat caused us after the summer of 1917. It is estimated that three hundred million bushels of wheat were destroyed by the ravages of stem rust that summer in the United States and Canada. Had it not been for the careful saving and husbanding of our wheat supplies, these losses might have cost us the war.

Fortunately rust ravages occur only at intervals and are not seasonal in their appearance. The world will undoubtedly need all our spare wheat for some time, while our increasing population and better conditions of living for the laboring classes will steadily increase the consumption of wheat. This makes it more than ever necessary that the destructive diseases of wheat be overcome or prevented.

Many destructive cereal diseases are found in the United States, including rusts and smuts. Methods for the control of rust epidemics are being vigorously investigated by the U. S. Department of Agriculture and the various experiment stations, but no remedy has yet been completely successful. The common smut diseases of wheat, rye, barley and oats in the United States are largely if not entirely controlled and prevented by seed treatment methods which have been effectively placed before the farmers by an extensive campaign of two years. But while we have been successfully combating the cereal diseases with which we have become familiar through the losses they have caused us, we are quite suddenly brought to face hitherto unknown cereal diseases imported from abroad.

During the war, in order to sustain our allies in Europe, large importations of wheat from Australia were made to Pacific Coast ports. In this manner over six and one-quarter million bushels of wheat entered California ports, were ground into flour and reshipped to France. The bran and "by-products" remained here to be fed to stock. This arrangement served very well; but with the Australian wheat came the menace of two very destructive diseases called "take-all" and "flag smut." The Australian plant pathologists with honest consideration for our welfare warned us against the probability of importing these diseases with

"Take-All": Four plants in center foreground affected. (U. S. Dept. Agr.)

their wheat. Their statements show that these two diseases destroy from 10 per cent to 25 per cent of the wheat crops. Some fields are almost entirely destroyed, while others entirely escape.

The U. S. Government, in order to safeguard possible dangers from introduced diseases, restricted the use of imported wheat to milling purposes only and prohibited its use as seed. The spores of Australian cereal diseases can be carried into the fields by stock after being fed bran feeds and in this manner viable spores may start infection in grain fields. A start thus made is not likely to be observed until it has become well established and beyond control except by the use of heroic and drastic measures.

In spite of the safeguards erected against the introduction of cereal disease, a destructive outbreak of "take-all" and "flag smut" on wheat has been discovered in Illinois and Indiana. So serious is the damage that 95 per cent of the crop in some of the wheat fields has been destroyed. Whole fields have been plowed up to stop the spread of the diseases. A vigorous campaign is being inaugurated by federal and state forces to check and eradicate them before they become widespread. No outbreak has yet been reported in California. This, we believe, is due to the millers keeping faith with the government and not distributing imported wheat for seed to farmers. Even if infected seed had found its way to the farms, the universal practice of treating seed wheat with fungicides to kill smut spores, would very likely prevent the introduction of these imported diseases in most instances.

In order to clearly explain the necessity for strict quarantine measures against "take-all" and "flag smut," the nature and life history of each disease must be understood.

"Flag smut" of wheat (*Urocystis tritici* Koern.) belongs to the group of plant diseases which includes the well known stinking smut of wheat, covered smut of barley and oat smut. While most smuts cause the heads to change to masses of black fungous spores, the "flag smut" produces its spores usually on the leaves, sometimes on stems and chaff and rarely on the wheat itself. Wheat plants thus attacked are reduced in size and the head, if it appears, does not fill. The first indications of the disease are noticed in long lead colored stripes and confined between parallel veins of the leaf blades. When the disease becomes more advanced the stripes become ruptured and pour forth masses of dustv black spores. The long black streaks are sometimes confused with the black lenticular streaks of the old sori of stem rust. The peculiar black color of the spores of "flag smut" is, however, unmistakable. The behavior of the leaves differs from that of rusted leaves in that "flag smut" causes the leaves to twist and curl up very early in the season before stem rust becomes prevalent. With the rupturing of the leaf surface, the spores fall to the ground, followed by pieces of the dead leaves which carry more spores. In this manner the soil becomes infested wherever these spores are carried, whether by the wind or otherwise. As the spores occur in groups of one to five in close clusters held together with a mucilaginous substance and covered with bladder-like appendages, they are well protected against destruction from changes of weather. The spores do not germinate readily in water on reaching maturity, but remain in a resting stage for several months, yet they are viable and ready to attack the young wheat seedling when it starts to grow.

When the seeding season for wheat begins, the conditions are favorable for the germination of the spore cluster which sends out several germ tubes. These attack the young wheat seedling by means of fine germ tubes from secondary spores. As the wheat crops of Australia are frequently sown dry, as is the case in California, the first rains start both wheat seed and "flag smut" spores. If the seeding is delayed until the smut spores have germinated and, failing to find wheat plant hosts, have starved to death, the later planted wheat crop may largely escape infection. The stinking smut of wheat in California frequently behaves in the same manner. Late planted wheat, however, usually gives poor yields, and in addition many of our heavier soils can not be cultivated and planted during wet weather. Like "bunt" of wheat, the spores of "flag smut" become attached to the seed and may be killed by the use of the same fungicides which destroy the "bunt" spores. In Australia the remedy found most effective is the bluestone-lime treatment. "Flag smut," like "bunt" on the Pacific Coast, can not be eradicated by dipping the seed because of the infection of seedlings from spores germinating in the soil. However, dipping seed is always advised, especially when the seed is being brought in from outside districts.

When a district has become infested with "flag smut," there appears to be no certain way of eradicating the disease except by abandoning the growing of wheat over the whole area for a number of years. It is not known definitely how long the spores of "flag smut" will remain alive in the soil, but it is known that they are persistent

"Flag smut" (*Urocystis occulata*) in rye and "flag smut" (*Urocystis agropyri*) on Agropyron grass occur normally in the United States, but these smuts are incapable of attacking wheat.

"Take-all" (*Ophiobolus graminis*), the second serious disease of wheat and other cereals in Australia, has not been definitely encountered on cereals in the United States until very recently in Illinois. Cereal troubles closely resembling "take-all" have been observed in Oregon and Washington, but their identity appears to be in doubt.

"Take-all" seldom permits heads to form. When heads do appear they are blanched and never fill. The blanched head has caused the disease to be called "white-heads." The wheat seedlings are attacked at the earliest stages but they succumb at various periods of growth. Some plants are attacked before they pass out of the rosette or grassy stage. The plants appear dwarfed and bunchy with a bluish green color. The leaves turn yellow, shrivel and finally die. Other plants attacked later, or less severely, reach the heading stage only to die without maturing. "Take-all" attacks begin in centers and spread outward in an increasing radius until large areas are affected, as is the case with the phylloxera attacks in California vineyards.

The fungus begins by attacking the roots and then spreads upward. Plants may be found with the whole lower root system rotted off, but on the node above new roots may be seen starting out. If the soil is damp the new roots may sustain the plant for a time, when these roots also succumb. In this manner two or three nodes may send out roots in an attempt to mature the plant. Failure always results in the end. The dead and dying plants always show a blackened stalk with bunched and swollen portions of roots attacked.

Seed treatment has little effect on the disease, as the spores are produced on old diseased stubble several months after the crop has been harvested. Burning stubble has reduced the disease, but can not eradicate it, as the diseased roots are not destroyed. The only practical method of eradicating "take-all" in a district lies in starving the fungus by eradicating its hosts. "Take-all" is known to attack wheat, oats, barley, rye, rice, foxtail (*Hordeum murinum*), Bermuda grass (*Cynodon* sp.) and brome grass. These plants must be entirely eliminated if the disease is to be eradicated. This practice would have to be extended over a period of years to make eradication certain. The prevalence of the hosts in California, both in volunteer and wild forms, renders the task next to impossible.

[Since this paper was written the Federal Horticultural Board has placed a quarantine (Quarantine No. 39 [with regulations] effective on or after August 15, 1919) on the importation into the United States of rice, wheat, oats, barley, and rye from Australia, India, Japan, Italy, France, Germany, Belgium, Great Britain, Ireland and Brazil. Permits to import these cereals may be secured but the grain on entry into the United States must be sterilized according to methods satisfactory to the Federal Horticultural Board. When any of these cereals are milled in the United States, the bran or products containing bran and screenings only shall be subject to sterilization. These regulations do not apply to husked or polished rice imported for food purposes.]

A quarantine against "flag smut" and "take-all" is proposed by the Federal Horticultural Board at Washington. "Flag smut" is prevalent in Australia and is known to exist in India and Japan. "Take-all" is reported in Italy, France, Germany, Belgium, Great Britain, Ireland, Brazil and Australia. "Flag smut" attacks wheat only, while "take-all" may affect wheat, rye barley and rice. The importations of these cereals from infected regions is a direct menace to the farmers of the United States. The necessity for excluding these diseases must be considered in relation: (1) to the status of commercial importation of grain for human and animal consumption, and (2) to the introduction of the new and promising varieties of cereals found in the countries affected.

The importation of cereals for seed purposes appears to offer no great difficulty. Small lots of seed may be imported from the foreign countries under quarantine, subject to the inspection of the Federal Horticultural Board. The seed may then be properly sterilized and planted in the U. S. Department of Agriculture

"Take-All": The effect of sterilizing wheat by heat is clearly shown above. No. 1 (check)—Wheat not heated; No. 2—Wheat treated 3 minutes at a temperature of 100° C.; No. 3—Wheat treated 5 minutes at a temperature of 100° C. (U. S. Dept. Agr.)

plant introduction garden at Chico or in some other properly supervised place under federal or state control. By the time a promising variety has been increased sufficiently to be distributed, its adaptability to our climatic and other conditions will be determined. An outbreak of disease would, under these circumstances, be next to impossible.

The effect of the quarantine on commercial importations of cereals is more complicated. During pre-war times 10,000 bushels of wheat was the largest importation from countries outside of North America for any single year. Usually a few hundred bushels only were imported. Rye, barley and oats importations were negligible. Rice importations, on the contrary, were frequently above 50,000,000 pounds.

During the war, maize from Asiatic countries, where Physoderma and other corn diseases exist, was permitted to enter the United States after sterilization. This required a heat of 212 degrees Fahrenheit, applied for a net period of three minutes. This destroyed the disease spores and improved the quality of the corn.

This treatment applied to barley, oats or rye does not interfere with the value of the cereal for stock feed. It does, however, kill the germ of the seed, making it useless for planting. Experiments completed and in progress show that the value of wheat for flour and bread making is also seriously impaired. Heating wheat with dry heat to 140 degrees Fahrenheit destroys all insects, but injury to the quality of the flour for baking begins at 160 degrees Fahrenheit and is completely ruinous to good bread making at 212 degrees Fahrenheit. The loaf decreases in volume as the heat is increased, while at the same time the color becomes more yellow and the texture more brittle. The effect of live steam is even more pronounced. Live steam at 212 degrees Fahrenheit applied for three minutes reduces the loaf volume one-half and otherwise renders it unfit. No application of heat which does not seriously injure the flour for bread making, will destroy the fungous spores and conversely all applications of heat which destroy the spores completely ruin the flour for bread making.

Table I. Effect of heating of wheat on bread.

	Volume of loaf.
(*a*) Effect of sterilizing imported wheat by dry heat:	
Check sample	2060
Sample dry heated at 140 degrees F. for 5 minutes	2060
Sample dry heated at 160 degrees F. for 5 minutes	2020
Sample dry heated at 180 degrees F. for 5 minutes	2000
Sample dry heated at 200 degrees F. for 5 minutes	1950
Sample dry heated at 212 degrees F. for 5 minutes	1750
(*b*) Effect of sterilizing imported wheat by live steam:	
Check sample	2170
Sample heated by live steam at 212 degrees F. for 3 minutes	1600
Sample heated by live steam at 212 degrees F. for 3 minutes	1500

Table II. Sterilization of bran and middlings from imported Australian wheat.

Material	Temperature (degrees F)	Live steam (minutes)	Dry heat (minutes)	Infection
No. 1. Bran	Check	0	0	P, M, B
No. 2. Bran	180	----------	5	P, M, B
No. 3. Bran	200	----------	5	P, M, B
No. 4. Bran	212	----------	5	P, M, B
No. 5. Middlings	212	----------	5	P, M, B
No. 6. Bran	212	5	0	None
No. 7. Bran	200	----------	Up to only	P, M, B
No. 8. Bran	230	----------	Up to only	P, M, B
No. 9. Bran	212	5	15 min.	None
No. 10. Bran	212	5	10 at 60° F.	None
No. 11. Middlings	Check	0	0	P, M, B, etc.

Cultured on prune and potato agar by Professor E. H. Smith.
Plated May 13; noted May 19, 1919.
P—Penicellum. M—Mucor. B—Bacteria.
[Sterilization and baking tests made by C. B. Kress, Chemist, Sperry Flour Company, Vallejo, California.]

It is proposed that the bran and other by-products from milling the wheat, be sterilized, but that the wheat be milled without sterilization. Experiments show that this can be done successfully with a minimum expense. Care in confining the dust and all portions of the wheat and subjecting them to sterilization may remove the objection to wheat importations. The added expense caused by the necessity of sterilizing wheat by-products will be a decided handicap when the world wheat markets again become normal. In the meantime importation of Australian wheat will soon cease. No more importations of wheat into the United States will be permitted until the 1919 wheat crop is sold, or until June 30, 1920.

From the evidence produced by many experts and specialists at various times and places there appears to be no proper reason why a strict quarantine against the "flag smut" and "take-all" diseases of cereals should not be established.

DR. JOHNSON (Washington, D. C.): I visited the fields in Illinois and found a considerable area, known as the American Bottoms, on the Illinois side of the Mississippi River just east of St. Louis, infected. This includes an area of upwards of some 4,000 acres. Not all fields in that area are infected, yet a considerable percentage are, for the infected fields vary greatly in the severity of infection.

Where the infection is slight, it may appear as patches in the fields, of varying size from a foot in diameter, and irregular in outline, up to sixty or seventy feet in diameter. Such infected patches are characteristic of this "take-all" trouble.

In the worst infected fields, naturally these patches have all run together and we have practically the entire fields, or large portions of them, affected. In such fields and in the patches, the percentages of infected plants vary somewhat; yet it usually runs very high where the disease occurs at all, that is from 85 to 90 per cent up to 98 per cent of the plants. These infected plants show the characteristic attacks of the disease, as described by Professor Mackie.

MR. MASKEW: Were you able to obtain any connection with imported wheat?

DR. JOHNSON: We have no definite clue as to importation from Australia, but the circumstantial evidence seems to point in that direction.

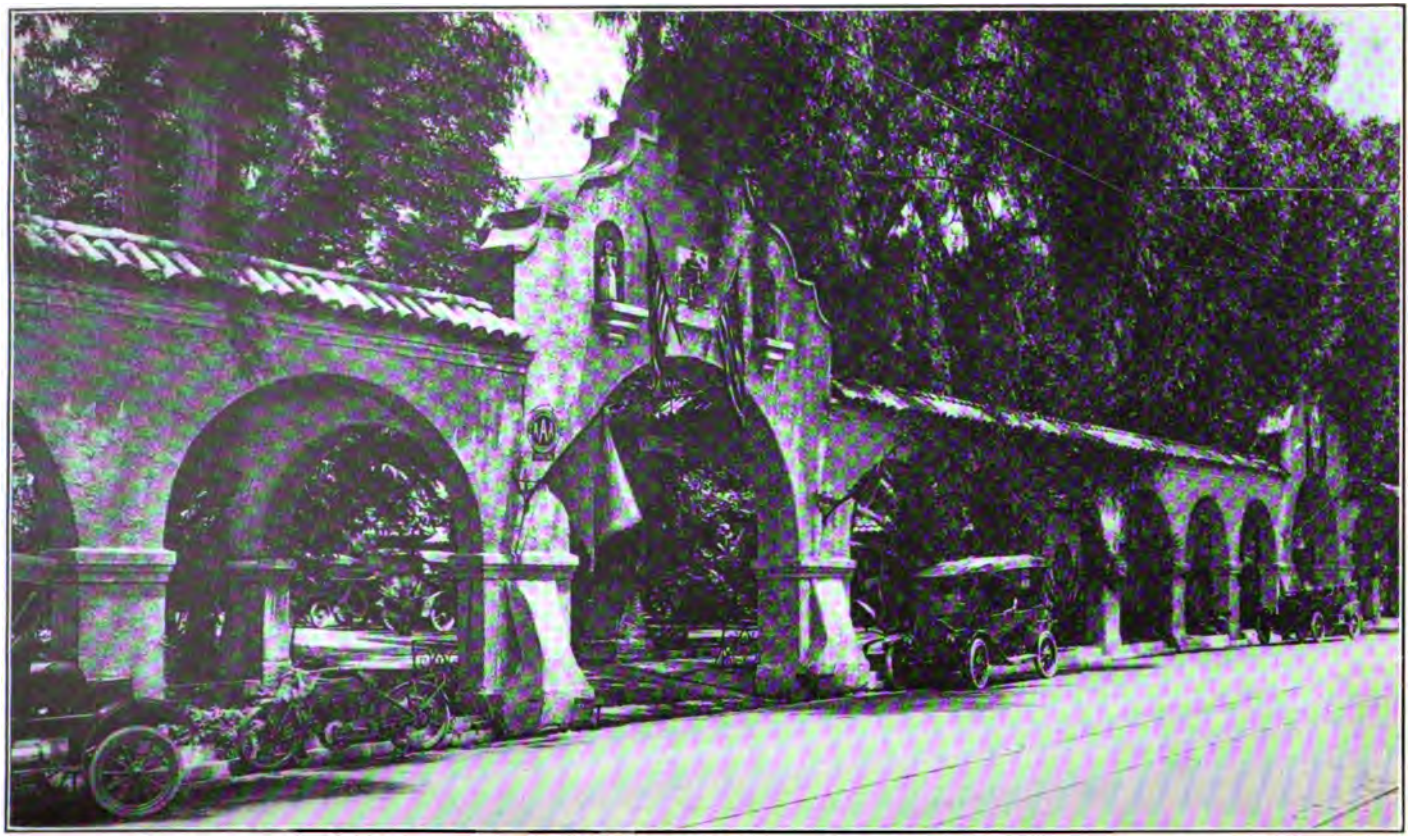
MR. M. B. MACKAY (Corvallis, Oregon): I would like to know what measures have been taken in handling the straw. Are they planning to destroy all nursery packing? Are the Illinois authorities taking any measures to destroy infected straw?

DR. JOHNSON: That is a detail that will have to be decided rather promptly, but action has not yet been taken. I have no doubt proper measures will be taken.

MR. MASKEW: We may understand in a general way then that straw will not be used in such manner as to distribute the disease from Illinois? Can rice straw come in ordinary rice packing and can we connect it with the "take-all" disease?

DR. JOHNSON: The "take-all" is an infectious disease, and since it is a straw-infecting organism, I see no reason why it can not be carried in the straw.

(*The Convention then adjourned until May 27.*)



Entrance, Mission Inn, where the Fifty-first Fruit Growers' Convention was held.

MORNING SESSION.

The State Commissioner of Horticulture, G. H. Hecke, in the chair.

Meeting called to order at 10 a.m., Tuesday, May 27, 1919.

THE CHAIRMAN: *Gentlemen*—The Conference may come to order. You are in a delightful place. If you take into consideration the restful atmosphere of the Mission Inn, which has something of the old Mexican tint about it, you will know how to excuse those who are not here on time this morning. This is a very interesting program.

Before we start with the program I wish to say that the representatives of the Western states and of British Columbia and Lower California met last night and requested that I, as the chairman of the Interstate Plant Quarantine Conference, appoint a committee to report on the proposed draft of the plan of organization of a western quarantine association as soon as possible, and I take pleasure now in appointing the committee, consisting of Mr. Park of Oregon, Mr. Dean of Washington, Mr. Maskew of California, Mr. Wicks of Idaho and Mr. Lyne of British Columbia. We will ask Mr. Hagan to serve as secretary of this committee. We will now go ahead with the regular program.

Mr. Henderson not being here, Mr. Hagan will read the paper written by Mr. Henderson of Utah on "Interstate Quarantine on Alfalfa Weevil."

(*Mr. Hagan read the following*):

INTERSTATE QUARANTINE ON ALFALFA WEEVIL.

By W. W. HENDERSON, Utah.

The alfalfa weevil, scientifically known as *Hypera postica*, became known in Utah in 1904 when its first injury was noticed in an alfalfa field near Salt Lake City. Our present knowledge of the insect would lead us to believe that its introduction was accomplished about ten years previous to this time, or about 1895. As soon as the insect was discovered, the Utah Experiment Station undertook a study of it looking to control. Widespread interest was soon manifested everywhere on the part of farmers who were loathe to see the chief forage crop of the state in danger. For a few years there were hopes that complete eradication would be possible, but these hopes were abandoned and alfalfa growers began looking earnestly for means of control.

As alfalfa is probably the chief forage crop of all the far western states, other states than Utah began to look upon the weevil with grave suspicion. They also hoped to see complete eradication and carefully watched the results of experimental study in Utah. When it became apparent, following the publication of the first alfalfa weevil bulletin by the Utah Experiment Station in 1910, that complete eradication of the weevil was perhaps impossible, surrounding states began to talk of quarantine as a means of protecting themselves against the pest.

The first quarantine was enacted by California, effective August 13, 1912. Arizona followed September 3 of the same year. Idaho, Montana, Nevada and Oregon established quarantine in 1913, and Colorado and Wyoming in 1917. Washington has decided to enact a quarantine which is promised this year. Kansas, Nebraska and Texas are looking this way with some misgivings, and it may be that some other states are thinking seriously of alfalfa weevil quarantine. The last quarantine was enacted by Nevada, April 12, 1919. In all, twenty-seven enactments have been established by nine states from August, 1912, to April, 1919, with three more promised for 1919. The following table shows the states which have established quarantine with the dates of their various enactments.

Table I. States and dates of quarantine against the alfalfa weevil.

Arizona—September 3, 1912; November 16, 1917; January 15, 1918.
California—August 13, 1912; October 15, 1912; December 17, 1912; February 27, 1913; December 29, 1916; January 31, 1918; October 15, 1918.
Colorado—September 22, 1917; March 15, 1918; September 1, 1918.
Idaho—February 24, 1913; March 3, 1913; August 1, 1918.
Montana—June 17, 1913; July 1, 1913; September 13, 1915; June 10, 1916; July 6, 1918.
Nevada—May 19, 1913; April 6, 1918; April 12, 1919.
Oregon—February 26, 1913; March 6, 1913; another promised in 1919.
Wyoming—Assumed only, similar to Colorado.
Washington—Promised in 1919.

A careful consideration of each of the twenty-seven quarantines shows that many are revisions or modifications and in most or all cases the last enacted by each state supersedes all others.

The commodities under quarantine by these states are as follows:

Table II. Commodities quarantined or under regulation.

1. Alfalfa hay.
2. All hay.
3. Bees in hives.
4. Tule.
5. Merchandise shipments.
6. Cereal straw.
7. Grain.
8. Alfalfa seed.
9. Nursery stock.
10. Potatoes.
11. Vegetables.
12. Fruits.
13. Movables: immigrant, agricultural or household.
14. Live stock.
15. Salt grass.
16. Cars and conveyances.

These commodities fall into two classes: those under unqualified or unconditional quarantine and those under limited quarantine or regulations. The following tables list the various commodities and show the states which hold them in quarantine:

Table III. Unqualified quarantine.

All hay—Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon.
Straw—Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon.
Grain—Arizona.
Alfalfa seed—Arizona, Oregon.
Nursery stock—Arizona.
Forage plants—Oregon.

Table IV. Limited quarantine.

Immigrant or agricultural movables—Arizona, California, Idaho, Montana, Nevada.
Live stock—Arizona, California, Montana, Nevada.
State line, live stock food—Arizona, California, Montana, Nevada.
Nursery stock and packing—California, Colorado, Idaho, Montana, Nevada.
Railroad cars—Arizona, California, Montana, Nevada.
Potatoes—California, Montana, Nevada.
Salt grass—California, Idaho, Montana, Nevada.
Fruit (fresh)—Montana.
Vegetables—Montana.

From the foregoing tables it will be seen that all hay and all cereal straw are held under absolute and unconditional quarantine by all the states. In addition Arizona holds unconditional quarantine against grain, alfalfa seed, nursery stock, vegetables and fruits. In addition to hay and straw Oregon holds out alfalfa seed, forage plants and weeds. The limited quarantines are practically all alike and are intended to allow entrance into the various states of the commodities named following fumigation or rigid inspection and quarantine against contamination with alfalfa hay. Colorado has the simplest quarantine, which holds absolute quarantine against hay and straw and limited quarantine against nursery stock.

The following summary given by Mr. George I. Reeves, in Farmer's Bulletin No. 741 (U. S. Dept. Agr.), is interesting in this connection:

> "That no one knows exactly how the weevils spread, may be inferred from the conflicting quarantine regulations designed by uninfested states to exclude them. Thus, Arizona forbids the importation of nursery stock; California requires its fumigation at origin and delivery and forbids packing with hay, straw, or rushes; Idaho differs from California in permitting the use of rushes; Montana requires official fumigation at the point of origin; Oregon forbids the use of rushes and forage plants as packing; Arizona prohibits the importation of fruits; Montana the importation of both fruits and vegetables from April 1 to October 31, except such as are inspected at designated points by the state of Utah from August 1 to October 13. Arizona and Oregon prohibit the entrance of alfalfa seed; California and Idaho require it to be fumigated by an official after arrival; and Montana requires it to be so fumigated before shipment. Hay and straw of all kinds are barred by all five states. Bees in hives are refused admittance by California and Idaho; and Oregon requires that they shall not be packed in rushes, weeds, or forage. Household goods must be inspected before shipment into Arizona. Live stock can be shipped into Arizona only with the consent of the State Entomologist and must be transferred to clean cars before crossing the line. California and Idaho prescribe that hay and straw must not be used in cattle cars, and Oregon forbids also grass and forage crops. Grain is barred from Arizona."

Since this summary was given by Mr. Reeves in 1916, a few changes have been made as will be apparent from a study of the tables, which changes, by the way, do not make the views of the various states any the less conflicting.

The territory now under quarantine on account of the weevil is as follows:

(1.) All of Utah.

(2.) All of Idaho. Nevada is the only state which specifies all of Idaho. The other states name the following counties: Cassia, Bingham, Bear Lake, Oneida, Bannock, Franklin, Power, Payette and Madison.

(3.) The following counties in Wyoming: Uintah, Sweetwater and Lincoln.

(4.) Delta and Gunnison counties in Colorado.

With these facts before us, let us now ask the question, "What is the basis for the quarantines which these states hold?" In this connection the following theory published in Bulletin No. 110 of the Utah station may be valuable:

> "The actual manner of introduction will probably never be known, since there are a number of ways by which this could have been readily accomplished. The weevil hibernating in any sheltered spot might easily have crawled into straw, hay or other material to be used in shipping household goods, crockery or nursery stock into the United States. The boxes containing these goods or other material shipped may have been standing out of doors in the infested regions and thus easily have become hibernating places for the insects. It is probable that this species has been previously introduced into the states along the Atlantic Coast, but not finding the proper food plant did not obtain a foothold."

It should be remembered that this statement was published only as a hypothesis and before many facts were known in regard to the means of distribution of the alfalfa weevil. But we fear that too many or all of the states have taken this hypothesis as a fact on which to base their quarantine laws. In all the years which have lapsed since 1904, the weevil has been under very close and constant study in Utah by the Utah Experiment Station and also by the United States Bureau of Entomology. It has come to be a pretty well established fact that the insect does not generally spread as the above hypothesis suggests. In fact, the spread of the weevil has been slow and gradual, and entirely by contact, at the rate of about ten miles a year. Utah itself is of course an exception. The Payette County, Idaho, infestation is perhaps not an exception and it is not absolutely certain that the Colorado infestations are an exception, though we confess that there may be a slight possibility of the latter.

The Utah Experiment Station has made investigations and inspections of the commodities mentioned in all the quarantines of all the states and finds no justification in holding out any of the commodities mentioned except alfalfa hay

and things contaminated by it when used as packing. Our findings have been abundantly confirmed by the more extensive studies of Mr. Reeves and his assistants of the Bureau of Entomology. Mr. Reeves has kindly permitted me to use a summary in this connection of certain work along this line performed by Mr. Chamberlain. The summary follows:

A statement of the facts relating to the transportation of alfalfa weevils by the railroads and other agencies as developed by our work in 1913 is herewith submitted:

As a result of this investigation, I do not hesitate to say that there is danger of spreading alfalfa weevils by shipping alfalfa hay or any produce which has been handled in contact with it between July 15 and the beginning of winter. Practically the only crop which is so handled is potatoes, and it would be easy to handle them, and all other produce in such a way as to eliminate the danger. The facts are as follows:

An agent of the Bureau of Entomology met and examined at Butte, Montana, practically all trains which carried Utah produce, from July 17 to August 5, 1913. He inspected the sides and tops of coal, coke and other freight cars and the interior of several passenger cars, and minutely examined the floor, walls and contents of 24 express and 21 freight cars. In the course of this work 363 packages, consisting of 90 crates of apricots, 82 cases of cucumbers, 74 sacks of beans, 59 cases of plums, 37 crates of cabbage and smaller quantities of squash, peas, tomatoes, cherries and corn were opened and carefully examined. Three hundred thirty-four burlap-covered milk cans were carefully scrutinized. Seven carloads of potatoes from Ogden were inspected and 1,011 sacks were examined in the car or upon the scales. In 6 of these potato cars 51 weevils were found, mostly upon the outside of the bags, but some on the floors of the cars and a few inside the sacks.

Montana quarantine officials took part in the search for weevils and neither they nor our men found any alfalfa weevils except those just mentioned.

During the progress of this inspection at Butte, an agent of our bureau was stationed at Brigham, Utah, to watch the picking, packing and shipping of produce, giving special attention to that which was consigned to Butte, and another agent was stationed at Pocatello, Idaho, to inspect Utah produce and other freight and express, some of which is broken out of carload lots at Pocatello to be forwarded to northern and western points. Shipments from Brigham to Butte were thus under the scrutiny of experts at three different stations.

Our agent at Brigham watched the picking of fruit at 23 orchards and berry patches from July 15 to August 9. He examined the outside (walls only) of 250 freight cars which stood on the sidetracks at different times, and also of the cars of 18 trains which stopped at the depot, and thoroughly examined the inside of 23 box and express cars. He examined 3,700 cases of fruit and vegetables at packing houses and the express office, besides inspecting the floor, benches, trucks and platforms, the 3,700 cases being divided as follows:

Apples	104 cases	Raspberries	120 cases
Apricots	868 cases	Dewberries	180 cases
Peaches	362 cases	Corn	30 sacks
Plums	110 cases	Cucumbers	205 sacks
Cherries	19 cases	Beans	20 sacks
Strawberries	30 cases	Mixed fruit	1056 cases

He watched the loading of 3 cars of fruit, made daily inspection of the freight and express depots and their contents, and rode in the express cars of the afternoon train from Brigham to Cache Junction with fruit shipments eight times, during which he noted that insects of various kinds began crawling out of packages of produce as soon as the train started. In the course of this work at Brigham he found 1 dead weevil in a cocoon in a car of baled hay and 2 live ones in the local express car leaving Brigham, but no other weevils in connection with produce.

At Pocatello we examined the fruit and vegetable shipments in 50 cars, the outside of 56 freight cars and 37 through passenger trains and the inside of the baggage and express cars of most of these trains, without finding any weevils.

The reason why so many weevils occurred in potatoes and so few in any other commodity is indicated by the fact that all the potato cars which contained weevils at Butte were littered with fragments of alfalfa hay, while the single

car which was free from weevils contained no indication that the contents had been in contact with hay. The potatoes in the infested cars had been hauled to the cars on piles of green hay which at that season contains many weevils. The weevils had climbed from the alfalfa to the sacks and had been loaded directly into cars, sealed in, and carried to Butte.

This explanation is confirmed by observations made at Salt Lake City, Ogden, Brigham and Provo, from July 18 to the close of the season, by another agent of our bureau. He was occupied from July 18 to July 30 examining the Salt Lake Farmers' Market, where about 200 wagons daily bring produce from farms in the the heart of the infested district. Of the two largest produce companies, both owned by farmers, the larger, known as the Growers' Exchange, has a membership of 200, all of whom bring their unsold produce to the warehouse after each morning's market. The amount handled in a day is very large.

In examining wagons, search was made for weevils throughout each wagon and its contents, and note was made of the district from which the load came, the degree of infestation of fields in that district, the distance of the orchard or garden from the nearest alfalfa, the presence of alfalfa hay or fragments thereof in the load, and in case hay was found, of the time when it had been cut, whether taken from a stack or field, and the abundance of weevils in the field. In examining warehouses, the building and all old barrels and sacks were inspected minutely, using an electric flashlamp in dark places and inserting forceps in cracks. The produce was examined as carefully as possible and often shaken over paper to dislodge any concealed insects. The floor was swept after each day's business, and the sweepings examined most carefully. During the investigation of this market 62 wagons were thoroughly examined in the manner described, and the Growers' Exchange and the Producers' Distributing Company were each inspected seven times and the Utah Vegetable Company's premises twice. Not a single weevil was found.

After July 30 but ten inspections of warehouses and 38 wagons were made, and more time was devoted to examination of the farms from which the produce came, in an effort to learn why no weevils were brought in when the fields contained so many of them. Fields in the neighborhood of gardens and orchards were found to contain great numbers of weevils, but these showed no tendency to leave the alfalfa and none was found on other plants. The fruit and vegetables rarely came in contact with alfalfa during their picking and packing, and practically no alfalfa was carried on the wagons except upon canvas covers which protected the load from contamination. Root crops which would naturally be subject to visits from weevils crawling on the ground, were always washed before loading.

The best evidence that alfalfa hay was directly responsible for the only weevils that were found in railroad shipments, was obtained by watching the loading of produce into cars at Ogden, Brigham and Provo. During 5 days spent in Ogden, one of our agents watched the unloading of 8 wagons and the loading of 5 cars of potatoes and found 5 live and 21 dead weevils, all on sacks of potatoes which had been hauled upon alfalfa hay or covered with it. Another agent examined 21 wagons and 14 cars of potatoes at Ogden between August 5 and October 11, finding 49 weevils. In all cases where examination of wagons direct from the field was possible, there was alfalfa hay, recently cut, upon or underneath the load, with one exception where 3 weevils were found in a load which contained no hay, but part of which had been allowed to stand in a patch of volunteer alfalfa before it was placed in the wagon.

During six inspections of commission warehouses at Ogden between August 6 and August 20, 2 weevils were found in potatoes and 1 on the outside of a box of apples. The load on which the latter came from Roy contained no hay, but a part of it had been allowed to stand near alfalfa for some time after picking and before loading.

Eight examinations of packinghouses and 2 of orchards were made at Brigham in August and 1 weevil was found under an empty case which had been left lying in a cherry orchard at the close of the picking season, four days earlier.

In six days work at Provo, 5 warehouses and 5 orchard examinations were made, resulting in the discovery of 1 dead weevil near a stack of sacked potatoes, 2 dead and 2 living weevils in a sack, and 1 live one on the floor where empty boxes were thrown as the pears were taken out by the sorters.

At Denver between the twenty-first of August and the twenty-second of October an agent of our bureau watched the unloading and handling of Utah produce

from 94 cars. Of these cars, 45 contained peaches, 43 potatoes, 2 prunes, 2 pears, 1 apples and 1 mixed fruit. In the potato cars a total of 7 living weevils were found. Several dead ones were also picked up. Of fruit in Utah express shipments, this same agent looked over 33 boxes and 7 crates. No weevils were found in this material. In Denver warehouses were also examined 3,126 boxes and 180 crates of fruit and 175 sacks of potatoes and no weevils were found in any of it. Much of the material was examined minutely and considerable time was spent in watching the sorting of potatoes over screens.

No mention has been made of alfalfa seed. It is in an entirely different class from the other products discussed herein. It is threshed after the weevils have gone to the ground for the winter. Few if any weevils are hauled to the thresher and none are brought away from it with the seed. Our examinations of the entire crop of seed from hundreds of acres in the only seed producing section now infested show that no weevils are present in the seed when it comes to the cleaning mill, and by digging up weevils from the ground and introducing them into the uncleaned seed we were able to prove that the mill removed with the heavy, large refuse all the weevils that it did not crush in the process. I have been requested by Montana officials to ascertain the fumigation strength necessary to kill weevils in alfalfa seed, and at first undertook to do it, but I later decided otherwise for two reasons: first, that at the season of the year when alfalfa seed is handled weevils can not be obtained even sufficient for experimental purposes without actually digging them out of the ground and any experiment run under such conditions would be not only uncalled for but uncertain and probably worthless; and second, that any statement which I might make regarding the strength of fumigants necessary to kill weevils in seed, while it would doubtless be safe in the hands of Montana and Utah officials, would, if made public, almost certainly be distorted by unscrupulous persons into a declaration on the part of government investigators that fumigation of Utah alfalfa seed was necessary, which is as far as possible from our opinion.

The following conclusions are evident from the foregoing observations:

No commodity which is shipped out of the territory infested by the alfalfa weevil should be allowed to come in contact with alfalfa or alfalfa hay between July 15 and the end of autumn. Practically the only change required in the present handling of produce is in the case of potatoes, and this would be obviated if the potatoes were screened at the car."

The means of distribution of the alfalfa weevil as described in the Utah Bulletin referred to above probably gives the wrong impression. The facts are that weevils are rarely on the wing. Their distribution by flight is almost negligible. In the summer of 1914, the U. S. Bureau of Entomology at Salt Lake City erected a screen in the midst of the worst alfalfa weevil infestations in Utah. During the season from March 25 to November 22, only 632 weevils were captured on a screen, having an area of 160 square feet, or fewer than 4 weevils per square foot for the season. The full conditions are here given as compiled by Mr. Chamberlain:

THE FLIGHT OF THE WEEVIL.

"In 1914, when refined coal tar was used as a coating, many different screens were used, with the number of square feet exposed varying from 60 to 428 feet. The average number of square feet exposed throughout the period was 84.5, but this figure should not be considered important for it was obtained by including all those days towards the end of the season when few weevils were flying and on which the screen was left down for several days at a time. The number of weevils caught during the period from June 27 to September 1 was 536. The screen was put up at about weekly intervals between the first of September and the fourth of December, when the first snow fell, but no weevils were caught after the first of September.

The following table may be of some service in showing the extent of the summer flight in 1915. The dates on which the weevils were caught are given in one column and the number of weevils caught in another, the number of weevils being set after the date on which they were caught. In the third column is given the number of weevils caught between the dates given in column one and the dates themselves repeated. The total weevils caught for the season are given at the end of the table. The exposure of the screen was continuous with the exceptions noted. The screen coating was tree tanglefoot."

Flight experiments 1693 and 1695.

Screen, 4′ x 40′, set March 25, 1915.

Date	Weevils caught		Total number weevils
Mar. 25	0	March 25–31	2
27	1		
31	1		
Apr. 2	6	April 1–6	7
6	1		
7	0	April 7–13	3
12	0		
13	3		
19	1	April 14–19	1
May 17	1	April 20–May 17	1
June 8	1	May 18–June 8	1
15	7	June 9–17	7
18	2	June 18–28	4
23	1		
28	1		
29	3	June 29–July 8	30
30	1		
July 1	2		
2–6	3		
7	0		
8	21		
9	4	July 9–19	165
13	31		
14	40		
15	13		
16	59		
19	18		
20	23	July 20–26	102
21	26		
22	29		
23	11		
26	13		
		(Screen down much between July 26–31)	
Aug. 2	54	July 31–Aug. 9	193
3	38		
5	25		
6	26		
9	50		
10	34	Aug. 10–19	69
11	6		
12	9		
13	5		
18	13		
19	2		

Flight experiments 1693 and 1695—Continued.

Date	Weevils caught		Total number weevils
Aug. 20	5	Aug. 20-30	19
23	8		
25	2		
27	2		
30	2		
31	4	Aug. 31-Sept. 9	7
Sept. 2	3		
9	0		
13	1	Sept. 10-20	3
16	1		
20	1		
21	1	Sept. 21	1
21-22		(Screen down)	
30	1	Sept. 22-Oct. 4	5
Oct. 1	4		
4	0		
6	4	Oct. 5-14	11
7	5		
8	1		
12	1		
22	1	Oct. 15-25	1
23		To Nov. 22.	
Nov. 22		(Screen taken down)	632

Total weevils for season	632
Square feet of screen exposed	160
Average weevils per sq. ft. for season March 25 to Nov. 22	3.95

CONCLUSIONS.

(1) The present quarantine regulations of the various western states held against Utah on account of the alfalfa weevil are in a large measure unjustifiable and unnecessary.

(2) The alfalfa weevil has been under scientific investigation in Utah for fifteen years and no scientific basis has been discovered for much of the present quarantine laws.

(3) The distribution of the alfalfa weevil is accomplished by contact at the rate of about 10 miles per year where alfalfa fields are fairly continuous. Exceptions to this method have been exceedingly rare, if at all, and these exceptions are not known to have any relation to any of the present quarantine regulations.

(4) The only known means by which alfalfa weevil can be transported is in alfalfa hay or on objects contaminated only by alfalfa hay, particularly potatoes which have been brought to market in conveyances bedded with alfalfa hay.

(5) Absolute and unconditional quarantine is justifiable only in the single case of alfalfa hay. All other absolute quarantine on cereal straw, grain, alfalfa seed, nursery stock, vegetables, fruits, merchandise shipments and forage plants are unjustifiable and unsupported by scientific research and should be removed.

(6) Limited quarantine is justifiable only in the case of contamination directly with alfalfa hay used as packing or in conveyances bringing produce to markets.

(7) As the present quarantine laws against alfalfa weevil infested territory are a menace to the commercial and shipping interests and of little benefit to the states formulating them, it is suggested that the states having such quarantine laws, modify or revise them to conform to the facts established by scientific research.

THE CHAIRMAN: Mr. Hagan will follow this paper written by Mr. Henderson with some personal observations on alfalfa weevil control.

ALFALFA WEEVIL CONTROL IN UTAH.

By HAROLD R. HAGAN, Salt Lake City, Utah.

I expected to have a few minutes to write an article. I have not been in my office very much in the last two or three weeks, and after coming here I find that I have been kept unusually busy until a very late hour daily. I have jotted down two or three points and will take them up briefly.

Alfalfa weevil control seems to depend on a knowledge of the life history of the alfalfa weevil. I might make a few remarks on its life history, not to bring out anything new, but just to refresh it in your memory. The alfalfa weevil goes over winter, as a beetle, hibernating in any rubbish, around the fields, in barns, under boards, stacks of hay, and so on. When the warm weather comes, the weevils emerge; and as soon as the growth of the alfalfa starts, they begin feeding on the new growth. Their feeding is rather irregular and is generally on the main stems of the new growth. A few eggs are laid at that time, more or less promiscuously on the stems. In a short time after feeding, the weevils mate and lay their eggs in the stems by inserting their beaks and making rather large, regular, round holes in which they place from one to thirty or forty eggs. The eggs are somewhat orange colored and oval in shape. In a few days they hatch into larvæ which crawl up the stem to the tender top and there they eat into the tissue which is extremely delicate.

The growing tip is stopped and a new one starts below when that too is eaten off. In heavily infested districts the alfalfa does not grow up very high but tends to stool out and get bunchy. After thirty to fifty days the weevil becomes full grown. The latest deposited eggs have hatched into larvæ and the earliest hatched larvæ are full grown shortly before the normal cutting time. After spinning cocoons, the larvæ pass into the pupal stage lasting from eight to fourteen days, coming out as beetles, some time in the latter part of June or usually in July. The beetle feeds irregularly during the summer and goes into hibernation in the winter. The hibernation is not a true one because if it warms up during the winter the weevil comes out, and when it gets cold it goes back again. That embraces just enough life history to give us what I want here. Knowing that the weevil lives through the fall and winter, and that the delicate part of its life history seems to be the egg or larval stage, control measures are centered on the larval stage first of all. The first method tried is called "puddling." After flooding the field they take a leveler and scrape off all the larvæ, covering them with a layer of mud. That is sometimes effective but does not do much good to your soil. Then this method was abandoned and pasturing was tried, with farm animals of different species and with various rates of speed. That is, pasturing over a field in three or four days, or three or four weeks, or permanently pasturing. Sheep seem to give the best results. But even under the best methods of pasture, sheep can not be used without danger. A few years ago they used to let the growth continue longer than they do at the present time. When they saw that the weevil stopped the growth of the alfalfa they took that as an indication for the cutting of the field. The cutting is usually performed, not immediately following irrigation, but before that, and the hay is removed during a hot spell. Then the field is spring-toothed to stir up the soil and brush-dragged, or wire-dragged. This results in the formation of a fine dust mulch, tears off the green material of the second growth, crushes many larvæ and cocoons and causes a more or less uniform settling of dust over the field, smothering the remaining larvæ. Finally it stimulates the crop. It has produced excellent results, and is the commonly used control method at the present time. Now, the alfalfa weevil has compelled one thing; we no longer grow alfalfa successfully year after year, as when our fathers put it in. That same field is no longer handed on down to

the children. Alfalfa can not grow in Utah thirty or forty years as they kept it growing at one time. Now a rotation of crops must be practiced. From four to six or eight years is the general run. Six years is what is advocated.

There is a fourth means of control just coming into practice, and that is spraying. Frequently farmers put it up to us in this way: "What are we going to do when our soil is so sandy or so rocky that we can not brush-drag and get results, and we can not afford to plow up all the stones in the field?" Spraying has been experimented with by Mr. George I. Reeves of the Department of Agriculture for a number of years. He claims that spraying is just as cheap as the cultural method I have outlined, and for a man who has a spray outfit, it only necessitates the labor of application and cost of the material. Spray is applied about three weeks before the cutting time of the alfalfa. The spray used is lead arsenate at the rate of a little bit less than two pounds of lead arsenate to the acre. The method of using it is to use a power sprayer with a spray boom across the back with nozzles to cause a fine mist-like spray. He arranges his nozzles so that with a 75-pound pressure each nozzle sprays out four-fifths of a gallon per minute. Three nozzles, covering a swath of six feet will spray an acre in about seventeen to eighteen minutes. That is, labor time, when the machinery and everything is in condition. This control measure, Mr. Reeves tells me, is quite comparable to the cultural method in effectiveness and cost. Spraying will be practiced in a number of cases in Salt Lake this season. This is the first year they have tried to get the farmers to spray, so really it is in the experimental stage so far as the economic viewpoint is concerned.

The fifth method is that of parasite introduction. Among a number of introduced parasites one seems to be quite effective. It is called *Bathyplectes curculionis*. In this case, if a field is heavily infested, the infestation is not reduced until after the first crop is cut. Usually the principal attack of the parasite comes later than the development of the greatest abundance of weevil larvæ, but, last year, the former were numerous at mating time, because of the unusual warmth of that season, which caused a large number of the parasites to be killed by the heat. I would here like to call your attention to this fact, that although the parasite does apparently kill 70 per cent to 80 per cent of the weevil, we know that in the actual life or economy of this insect if 75 per cent or 80 per cent did not die anyway that Utah surely would soon have a layer of weevils two or three inches thick over the whole surface of the state. Now, if we take the 70 per cent or 80 per cent of the weevils killed by the parasite, probably 99 per cent of that 70 per cent would have died anyway, although, on the other hand, we might say that they probably attack the more virile larvæ and therefore kill off the greater part that would go over winter. I believe they do control the weevil in great measure, and we are glad to have it introduced.

THE CHAIRMAN: Will you explain the nature of that parasite?

MR. HAGAN: The parasite belongs to the bee group. It is a small, dark, wasplike, four-winged insect. It inserts its egg into the body of the host, which is the alfalfa weevil larva. There the egg hatches and feeds inside the larva, coming out as the larva of the weevil goes into the cocoon stage. This parasite spins a cocoon in the same place.

THE CHAIRMAN: I want to congratulate Mr. Henderson and Mr. Hagan on the very able papers they have given us. Before California succeeded in placing a quarantine against the introduction of the insect Mr. Hagan and Mr. Henderson have discussed, Mr. Weldon of our state met in conference with the representatives of Utah and other neighboring states, and there the provisions of the California quarantine were formulated. Is Mr. List here? I believe you are going to discuss these papers.

MR. G. M. LIST (Colorado): I will make my remarks brief. I realize this is a subject which will bring out full discussion. At least, I hope it will, because it is very important. Colorado is especially interested in this proposition. We are on both ends of the firing line, you may say. We have about three-quarters of a million acres of alfalfa hay in Colorado.

Of that three-quarters of a million there are a few hundred acres infested with the alfalfa weevil, and this is in a comparatively well isolated section. We are interested in preventing the spread of the weevil and its introduction into other sections. We are especially interested in quarantine regulation because the section that is infested in Colorado is one of our principal fruit and vegetable producing sections. Quarantines are liable to work a considerable hardship on this section. I think the other states are justified in placing reasonable quarantines, as far as our information will guide us in placing these quarantines. But we must realize that all of us are more interested in our own state, probably, than we are in any of the other states, although that feeling has been overcome, largely, in the last few years. We begin to realize that we must depend on the other states. One township, county or state, or country can not live independently any more, and especially is that true of the states. We must help ourselves by helping our neighbors, and I think if we can get that feeling in our quarantines and will work together, we are going to accomplish a great deal more than having the large number of quarantines that we have had. I consider it will only come about as a process of evolution or education. The constitution of the United States, even as broad as it is, has been amended a large number of times in the last few years, and it is only reasonable that these quarantines which were adopted in a hurry when the weevil was found in this country, should be amended, and I think it shows progress that they have been, and it is only natural that if we had five or ten quarantines drawn up by five or ten bodies, they would vary a great deal.

But these conferences we have been having have educated the quarantine officials and brought them together; and if nothing more comes out of this meeting than to bring us a little closer together on the weevil proposition, it is well worth while, and I only hope that we can get closer together and get our regulations more uniform and in a shape that will be more workable.

I have felt that the federal government, especially the federal horticultural board, should be interested in this proposition. It seems that we have never been able to get this board especially interested in the weevil or in our conditions in the West. I think this is something that is of sufficient importance to the nation as a whole to justify some consideration from that board. When we first located the weevil in Colorado, I made a trip to Salt Lake to investigate conditions there and I saw Mr. Reeve's data at that time. I am sorry that it has not been published before. I am mighty glad this data has been read here. While it apparently draws the conclusion that there is not much danger of the weevil being carried, I think the facts as stated in Mr. Henderson's paper prove that it can be carried. They have found it in other states in shipments and we have at least three cases where it has been carried: one where it was carried to Utah; one where it was carried from Utah several hundred miles into Idaho, and the other where it was carried from Utah at least three hundred miles into Colorado. As was stated in the paper, it was very probable that it was a natural spread in Utah and possibly also into Idaho. If any of you are acquainted with the conditions in eastern Utah and western Colorado, I think you will agree with me. The infestation in Colorado is a long distance away

from the infestation in Utah. And there is not only desert in between, but there are fifty miles of alfalfa in between that shows no infestation. So it is very plain, in my mind, after investigating the conditions, that it has been carried there mechanically and not as a natural spread.

Our experimental work has given results that are very convincing on a point or two. We have practically decided, from our work, that spring cultivation is not a control method in Colorado. It is a system for better culture. We are growing more alfalfa in spite of the weevil. According to our records in the fields—we have some thirty-five fields in our experimental work—not all of them spring cultivated, but on those that were spring cultivated the number of weevils and larva throughout the season was the same as on our check-plots, showing we had not reduced the number of weevils materially. We did get a better crop of hay simply because of the cultivation, and because of the fact that we stimulated the growth early in the season. The alfalfa was further advanced and was matured earlier and could be cut before damage occurred on the first crop. Cultivation after the first crop has been cut is very good some years. Last year it was of no value at all, because the weevils matured just a little earlier. It is possible that in other years it is going to give better results.

Spraying work has given the most promising results. We had a number of fields that were sprayed early in the season as soon as there was any activity of the weevils at all. We had a different field sprayed each week from that time on until cutting time. The earliest sprays were of little value. Those were the sprays for poisoning the over-wintering adults. The later sprays were very effective.

THE CHAIRMAN: You might repeat the suggestion that the federal horticultural board take up the question of the best possible control of the weevil.

MR. LIST: I don't think eradication is at all possible. I mentioned the fact that it seemed more reasonable in the quarantine work on the alfalfa weevil, if we could watch the central point instead of watching the thousand and one distributing points all over the entire alfalfa growing section. If we could get some system of watching that central point, some system that we would have confidence in, all of these quarantines by ten or twelve states would be useless and we would be gaining better results by the central work than we would by this distribution of the efforts all over the entire country. I think that is well brought out in our brown-tail and gipsy moths. We didn't worry much about that in the West here, because we have confidence in the board and its work in the affected territory. If it was not for the work of the board there would be something like forty states that would have quarantines on account of the brown-tail and the gipsy moths. Why would not the same theory work out on our alfalfa weevil?

This last winter we had considerable correspondence with Utah and Idaho in regard to establishing a system for handling our fruits and vegetables from the infested area, which would be acceptable to all the adjoining states and in that way do away with the quarantines on our fruits and vegetables. After our correspondence with Utah and Idaho, both of these states changed quarantine officials and we are right back where we started. The states are not going to have the confidence

in that kind of system unless we can, in some way, interest a larger number to co-operate with us to the extent of making uniform regulations. You can see what it may be to Delta County. Our principal crops there are apples, peaches and potatoes. Arizona has a strict quarantine on those products and we can not ship them into Arizona. Our greatest markets are Oklahoma and Texas, and both these states are considering quarantines, and if they establish the same quarantine that Arizona has it will put Delta County, and possibly others, pretty largely out of business in those lines, because our principal markets are in Texas and Oklahoma. Is there any way that we can get co-operation in handling fruits and vegetables so as to assure the people that there is no danger of carrying the weevil?

MR. W. H. WICKS (Idaho): We have in Idaho a number of important problems, and I think that the alfalfa weevil is one of the most important. The alfalfa weevil is a problem we are tussling with. We have gone so far as to quarantine the alfalfa from nine counties, so we are not only being quarantined by California and the other states but we have passed intercounty quarantine. The alfalfa industry represents a valuation of over $18,000,000 and stands at the head of our agricultural products. We feel that our own alfalfa industry must be protected, and you people believe you must be protected against our infested area. We are finding some little difficulty at the present time in the handling and distribution of alfalfa meal. It is not decided yet whether or not alfalfa meal carries the weevil. That is a question to leave to this conference for discussion. I am anxious to see it settled so that we of the Northwest may know whether alfalfa meal is a commodity to be handled without quarantine.

Personally, I have not had very much faith in quarantines in the state of Idaho. Although we have quarantined against certain of our counties, we find the weevil in fresh territory in spite of the quarantine. The weevil now is supposed to be in Payette County. It has also been found in Oregon County, though whether they got it from the Payette district I am not certain. Idaho is doing its very best for the protection of other states. We feel it is our duty not only to quarantine against the counties in our own state but to do what we can to secure efficient protection for the other states.

THE CHAIRMAN: We will now hear from Mr. A. L. Strausz, Horticultural Commissioner of Montana.

MR. A. L. STRAUSZ: I think the subject has been pretty well covered and I do not want to take much of your time. We have a quarantine in Montana which we know is complete against alfalfa hay and cereal straw. Our quarantine allows shipment of fruits and vegetables under certain regulations. We do not want to place a rigid quarantine against products from Utah or southern Idaho, especially fruits and vegetables. We are satisfied with the quarantine which we have and I believe that our regulations are very sane.

There is another point on which we should have more information. That is the exact distribution of the alfalfa weevil, especially in certain counties in Idaho.

I was at Salt Lake City a couple of days on my way down here. Mr. Hagan and I visited some of the counties and looked over a number of

alfalfa fields. I am well satisfied with the conditions as they exist there at present. I think that there is a possibility that the weevil might be carried from that district, but I think that the possibilities are not great. The possibility that the weevil will be carried on products coming from that section is not greater than that they will be carried in coal cars or in the baggage of travelers or in any other thing that comes out of the weevil-infested area.

THE CHAIRMAN: What is your opinion of the safety of the admittance of alfalfa meal?

MR. STRAUSZ: I don't know anything about that and I wouldn't want to say anything about it at present.

THE CHAIRMAN: Is there any other question on the alfalfa weevil?

MR. MASKEW: I doubt if there are any of us prepared to make an authoritative statement on that at present, and I think Mr. Reeves' opinion is well taken that we endeavor to secure data by actual observation and study of the situation. That is what I think he had in mind that the meeting should consider. I myself have not looked into this matter at all. I think we should follow up the suggestion and pursue this matter and see what we can learn about it.

MR. C. L. MARLATT (Chairman, Federal Horticultural Board): What states is the weevil now known to occur in?

MR. MASKEW: Colorado, Wyoming, Utah, Idaho, and I understand—we had better leave out Oregon until it is corroborated.

MR. A. KIMBALL (Arizona): It is evident from what has been acknowledged here, and our findings, that the alfalfa weevil is spreading. It has been conceded that it is known in several counties in Idaho, in Colorado, Wyoming, and we have considered all of Utah, especially the agricultural sections. Arizona is, as you know, the youngest state, and in agriculture is a new state. We discovered some eight or nine years ago that the nurserymen were dumping their diseased trees into our state, or our territory as it was at that time. We therefore succeeded in getting a horticultural law dealing only with fruits. But when we learned of the danger of alfalfa weevil from Utah, we took the matter up and secured an enactment by our legislature to provide for agriculture in connection with horticulture, that we might be able to quarantine against Utah and one or two counties of Idaho, on account of the alfalfa weevil. I am perfectly willing, representing my state, to be just as generous as any other, but I have set out, along with my associates, to see to it that these damaging insects and diseases do not come across the line into Arizona. If in any way we can plan a co-operative effort by the aid of the federal government to safeguard the other states against those that are now affected, I am willing to join in something of that kind; but it seems to me from what has been said this morning, that it would be necessary for the government to take hold of this thing and to keep the weevil within the borders of the districts that are affected, so that it can not spread any further; it would be a terrible calamity to Arizona. If you will pardon me—I will say that we can raise the best alfalfa in the world.

If there can be any plan devised by which we can safeguard the clean states of the South and the Northwest and the West, let us do it. But, for Heaven's sake, don't let this thing spread any further or our great

alfalfa industry will be ruined. We are the most rigid, I presume, of any state in the union on the quarantine. We love old Utah and we sympathize with you, but because you have got the evil you don't need to think that we want it. We have quarantined against some things, and I want to tell you that it is fair. It is not going to hurt anybody else particularly, only in the fact that it is shutting off their products from coming into our country. I want to say that I have come down here to join with you in all of these splendid activities for the good of all.

We are ready to join with these Western states in some way, if we can find that way, by which we can overcome and suppress the diseases within the limited bounds where they now exist without jeopardizing other states that are now clean.

THE CHAIRMAN: We are glad to have heard from you, and I believe we reciprocate your sentiments.

MR. HAGAN: I want you to feel as I do about this. I have no delusions about the weevil and my opinions are similar to your own, but when we come to talk about quarantining everything or quarantining things unnecessarily it seems a little bit overdrawn. For instance, current rumor has it that alfalfa seed was put on the quarantine list simply because Utah seed growers, thinking they could make a scoop, went out over the state and said, "Your seed is grown in alfalfa weevil districts and you can not sell it outside of the state. We will give you so-and-so per ton." They made their killing and when they came to dispose of that seed at a good price and pocket the proceeds they found that the other states had taken their buying propaganda seriously. When the seedmen came to sell they found the quarantine regulations established. Now that story may have been manufactured and I will not vouch for it. However, the quarantine was slapped on. A few months later several states said: "Gentlemen, we have made a mistake. Alfalfa seed can not carry the weevil. We don't see how it can. So we will let you ship your alfalfa seed in here." All but two states said that. Why don't those two states say the same thing? If they have got further data, let us have it. If alfalfa weevil can get in alfalfa seed, let us have those other states put the quarantine on again. So, in the paper I read for Professor Henderson, it is asked if the weevil gets into new territory on straw—if it can't get in on straw, excelsior or a dozen different things, what on earth is the use of listing them?

Two or three states say: "You can ship all the nursery stock you want to, but it must be fumigated in an airtight container; you must not use any tule hay or straw around that nursery stock." Why? If the fumigation is effective, wouldn't it kill a weevil in tule hay or straw as well as it does in excelsior? If the fumigation is no good and will not kill the weevil in the tule, what is the use of doing the fumigating? Why does one state put fifteen or twenty quarantines on grain and other commodities and the other state says, "I know from my common sense and experience that grain and these other commodities can not ordinarily carry the weevil any more than a passenger or baggage car can do it." If such conditions exist, I would like to see these gentlemen here assembled get together and say, "So far as we know, certain things are going to carry the weevil under ordinary conditions. Those things can

not come into our states." And I would agree with you on it. However, if you have not anything to support your contention, then let us ship such goods to your territory under proper inspection if you wish. If it is clearly that way, if there are any facts to support you in your contention, then you have something to talk about. Let us cull out the articles which could logically carry the weevil and remove the quarantine from the others. Our neighboring states have depended largely upon apprehension, and as a safeguard, have placed quarantines, though they might be unnecessary.

We have nearly 295,000 acres of alfalfa grown in Utah. I took Mr. Strausz over it the other day and he was surprised to find that it was yielding as much per acre as your states are getting. I will grant that there is expense attached to raising it. There is an expense in following any cultural method, but it returns to the soil and to the crop. We are getting as much an acre as we did before the weevil came.

Utah leads the United States in alfalfa seed production. We raise 6 bushels to the acre; Montana raises 5½ bushels; California raises 5 and Idaho 4.8. Our seed comes from that very crop that would be injured by the weevil if we could not control it and if the weevil was such a menace that you would like us to believe it is. Remember that we have worked with the weevil, controlled it, learned its life history and found out what articles might carry it to your areas. What we ask for is a reasonable and uniform quarantine based on facts.

MR. WICKS: Of course, Utah has not been affected in the importation of their products into our part of the country, but we know it is a terrible ban upon Utah and a very injurious thing, and I am sure, too, that advantage has been taken of the quarantine to quarantine a whole town or district, while the other had the opportunity to sell its crop. It is not fair and there has been an injustice brought on some localities in consequence of it. We want to get together here, if we can, and remove those barriers and help the afflicted centers as much as possible, but not to loosen things so as to jeopardize the safety or clean conditions existing in other places.

MR. BREMNER (California): There has been a principle of quarantine attacked here that is fundamental. It is not the things we know that can carry infection that we quarantine against but the things we don't know. I am in direct sympathy with Arizona, and I believe they are doing the right thing. If we had taken Arizona's stand years ago, in California, we would not have the pests we have here now.

MR. EHRHORN: Mr. Hagan was not present when the gentleman spoke of alfalfa meal, and I would like to ask Mr. Hagan about that.

MR. HAGAN: I can not say anything on that at all.

THE CHAIRMAN: Could you give any suggestions, Mr. Marlatt?

MR. MARLATT: I do not know that I can add very much to the information of this meeting. You are discussing a subject with which you are familiar and with which I am not. I think the answer to the question about central control has been given in the discussion you have had. The fact that the federal government undertook to control the distribution of products from infested territory would not prevent Arizona or any of the other states from taking additional precautions if they wanted to. A great many problems arise in which the state is

much more efficient in protecting itself than the federal government would be in attempting to take over that work, and it has always seemed to us that the alfalfa weevil was one of those problems. To have federal quarantine effective, it would be necessary to secure a very definite knowledge of distribution. Our work would be limited to interstate shipments. We could not help in the internal or interstate movement of a product. That would be a state matter and would remain a state matter. We probably could not take as broad a control as you could take, because we would have to show cause for all the products which we control. Distribution of the insect is so easy. I recall that on one occasion several of these insects were found in a suitcase of a boy going to the Kansas State Agricultural College. He found these bugs crawling around when he opened his suitcase to take out his clothes. The mere fact of the train passing through states and motors passing through the states and the improvement of roads will spread the insects. The federal government, to do this work, would have to provide for an army of inspectors to take care of the inspection of all these products in a half dozen states. They would have to be available for every shipper, to examine his goods and certify them, and the cost would run into millions of dollars. I don't believe the federal government could stand for it. I am heartily in sympathy with the idea that these states that are quarantining against the infested areas get together and determine on as limited a list as possible of products to be quarantined, and unifying their quarantines—that is, to harmonize them and eliminate all subjects that can be safely eliminated. But I feel rather strongly that it should remain as it is now, a state matter.

MR. DEAN: It seems to me that one of the greatest protections we could get would be the regulation of merchandise by transportation companies—the regulation of transportation companies in the handling of different products as they are hauling them about the country. While quarantine officer of the state of Montana, we traced shipments of alfalfa seed coming out of Utah into Kansas and Minneapolis, and back into the state of Montana; and this winter we have known of shipments of alfalfa hay coming from infested territory in Idaho contrary to the restrictions. The federal board could bring its power to bear upon the interstate regulation of traffic to the extent that it could prevent the movement of merchandise where we as individual states can not reach it beyond our state lines.

THE CHAIRMAN: Mr. Marlatt, you will be on the program again this afternoon. Will you think over this question during the noon hour? An adjournment will be in order until our next meeting at 2.00 p.m.

AFTERNOON SESSION.

The State Commissioner of Horticulture, Hon. G. H. Hecke, in the chair.

Meeting called to order at 2.00 p.m., Tuesday, May 27, 1919.

THE CHAIRMAN: The meeting will please come to order. We will not continue the alfalfa weevil discussion, which was not entirely finished this morning, but we will start in this afternoon with Mr. Marlatt's paper on the pink bollworm.

THE PINK BOLLWORM.

By C. L. MARLATT, Washington, D. C.

The big problem of the last two years for the Federal Horticultural Board has been the control of the pink bollworm enemy of cotton. The pink bollworm is an insect which looks very much like the codling moth and infests cotton bolls very much as the codling moth larva infests apples. It is a pinkish worm and hence the name. The native home of the insect seems to have been central India where cotton has long been commercially grown. The first record of this insect was in India some 75 years ago as a minor pest of cotton. Perhaps 12 years ago it was carried to Egypt with Indian cotton sent there for ginning, and in that way became established in the Nile Valley. From Egypt it has spread, through the agency of cotton seed, over most of the cotton-growing area of the world other than the United States, if we except the local, and all hope temporary, foothold it has gained in a few places in Texas. In the Hawaiian Islands it has practically stopped the commercial growth of cotton, and it is causing great losses to this crop in India and Brazil.

As noted, this insect attacks the cotton boll. It bores through the boll, destroys much of the lint and eventually enters the seed, where as a seed-infesting insect it finishes its larval career. It pupates in the boll or in the ground and comes out as a tiny moth to reinfest the cotton when the new bolls appear. In Hawaii, under favorable weather conditions, there are from four to six generations produced annually.

Very shortly after its introduction in Egypt it began to make its presence known there emphatically and spread in a few years throughout the cotton area of the Nile Valley. In Egypt it causes a loss to cotton of perhaps 15 per cent to 30 per cent of the crop, in spite of intensive methods of control which would be very expensive if conducted in this country. In addition to the government control and disinfection of all cotton seed the methods of control involve hand-cleaning of all the cotton fields and burning the stalks. Dry cotton plants are the chief source of fuel of the Egyptian farmer and the cotton stalks are stored for such use, but first they are drawn through a comb and all the bolls torn off and immediately burned. The stalks are then piled around the village centers and are inspected to see that all the bolls have been removed. Even with this very expensive process, which would cost us from $7 to $10 an acre, a very considerable loss is suffered annually from the pink bollworm, and without these measures the losses would probably be doubled. The pink bollworm is perhaps the most important cotton pest known.

To exclude this pest from America the Department of Agriculture early quarantined against foreign cotton seed and instituted protective measures with respect to imported cotton. Mexico was not fully included in that quarantine because the insect was not known to occur in that country, but in 1916 it was discovered that the insect did occur in Mexico, and the quarantine was immediately put into full effect as to Mexico, stopping all movement of cotton seed from that country to the United States and permitting entry of cotton lint only by way of the ports of New York and Boston, where it is disinfected. Before the pink bollworm was known to be in Mexico the entry from Mexico of cotton seed had been permitted for milling purposes only, and the year before the insect was discovered in Mexico a considerable quantity of cotton seed had been taken into Texas from Mexico for this purpose. Some 12 cotton seed oil mills had

Music Room, the Mission Inn.

received such seed in 1916 and steps were immediately taken to expedite the crushing of all the imported seed and to thoroughly clean the mills and surroundings of all scattered seed. All cotton fields in the neighborhood of these mills were kept under intensive inspection the following year, 1917, and such inspection has been continued each year since.

As a result of this inspection it developed in the summer and fall of 1917 that the insect had escaped and gained limited foothold at two places in Texas from such imported seed. One of these was at Hearne, where it had reached only a few small fields, and the other in eastern Texas—Beaumont—where the infestation was more widespread because the miller in the latter instance although importing this cotton seed under a permit for milling purposes only, proved to be untrustworthy and sold some of the seed for planting. These sales led to a scattering distribution of the insect in a radius of from fifteen to twenty miles around this mill. The infested fields were immediately subjected to a very intensive clean-up campaign. Later in the fall of 1917 a much larger area of infestation was determined immediately surrounding Trinity or Galveston Bay. The introduction of the insect in this region was apparently accidental from Mexican cotton intended for foreign export which had arrived at the docks of Galveston for transshipment to Europe. In the great storm of 1915 many bales of cotton were swept off the docks into the bay, among others Mexican cotton. Some of these bales were broken up and scattered around the margin of the bay. The great mass of them were salvaged and reclaimed and sent to the foreign market, but apparently from the broken and scattered Mexican bales the insect got a foothold in the area surrounding the bay where cotton is scatteringly grown. The infested area extended over about 7,000 acres of cotton land around the bay and the problem of control assumed enormous proportions. Congress was appealed to for adequate means to fight and if possible exterminate this new cotton pest. The initial appropriation of $50,000 was added to later by emergency appropriations of $250,000 and $500,000, and this year we expect to get $600,000 for the maintenance and continuation of this work.

The clean-up campaign which was instituted was in a measure similar to the methods that I have described for Egypt. All cotton in the three infested districts was uprooted and burned. The fields were afterwards gone over and the scattered bolls and leaves were hand-picked and burned. Where there was grassland weeds burners were used and the whole surface of the soil was fire swept and cleaned of vegetation. The effort was to exterminate the insects absolutely. The danger to our cotton crop was so great that we felt that no expense should be spared to effect this result.

The outlook for success was not very promising at the outset. The state of Texas had no law at that time giving authority to do such clean-up work within the state as was necessary. A special session of the state legislature was convened and Texas passed an act which gave the power to forbid the growth of cotton in infested districts for such a series of years as might be necessary to effect the extermination of this insect and to undertake such control measures as the extermination of the pest might require. In the work which followed the federal government furnished the funds and forces in large measure. Texas made an appropriation of some $10,000 and the Secretary of Agriculture of the state and his associates, as well as the cotton planters for the most part, entered into the work in thorough co-operation with the federal forces. Some twenty-five or thirty expert inspectors were early accumulated and placed under the field direction of Dr. W. D. Hunter, a member of the board, and such labor as could be obtained under war conditions was taken on. The planters turned their help over to us and eventually a force of 500 to nearly 1,000 laborers was in our service.

The results of this work went away beyond our expectations. Not a single pink bollworm was found in 1918 in the infested districts of 1917. Throughout the quarantined areas during the season of 1918 all seedling and volunteer cotton was destroyed, and in the examination of such cotton not a single infested boll was found even in places where the year before 75 per cent infestation had occurred!

The planters in the quarantined districts co-operated with us heartily except a few who were misled by certain lawyers on the lookout for fees who promised to protect them in the courts if they planted cotton. The crops of the planters who were thus induced to plant cotton in violation of the quarantine and state prohibition matured before legal action could be taken, but these fields were

thoroughly cleaned up in the fall of 1918, the cotton was shipped abroad and the seed ground. Not a single bollworm was found in the fields.

As to the future, the apparent success of the work of extermination has led us in co-operation with the Texas authorities and in deference to the earnest demand of the planters who have joined in the campaign to their own large financial loss, to permit cotton to be grown in the quarantined districts under license for the crop year of 1920, the grower giving the government and the state of Texas entire control of the crop produced. The cotton will be planted, grown and picked under supervision, shipped immediately abroad and the seed crushed. Field clean-up operations will be made thoroughly if a single instance of infestation is found, without regard to the crop. If infestation again develops in the quarantined districts the planters have agreed to desist from the growing of cotton for such a period of years as we may determine to be enough to complete the extermination of the insect.

This, in brief, is the situation up to this summer. Last fall the pink bollworm was found in the great bend of the Rio Grande. I think you know the state of Texas well enough to recall that great loop of the river below El Paso. The mountains on both the American and the Mexican sides run down to the river. It is a wild, sparsely inhabited grazing country and no one seemed to be aware that cotton was being grown there. Apparently, a few fields of cotton had been planted as a venture on both the American and the Mexican sides of the river in the restricted valleys which occasionally occur there. The American planters got their seed from Mexico and carried the infestation to a few fields on the American side of the river. The Mexican seed and cotton was smuggled across the river in defiance of the federal quarantine. Some of the cotton was sent overland to a mill in the Pecos Valley and this led to an infestation of a considerable area of new cotton development on the Pecos River near the towns of Barstow and Pecos. All of these infestations, like most of those of the year before in eastern Texas, were very slight, only a few attacked bolls being found. The Rio Grande and Pecos River areas have been cleaned up during the fall and winter of 1918-19 in the same thorough manner as in eastern Texas the year before, and for the most part, and especially in the Pecos Valley, with the hearty co-operation of the planters.

In the meantime the Texas law has been re-enacted and improved so that we have now more power to enforce necessary control measures.

I want to say just a word about the situation in Mexico. Naturally, if we could clean up the insect in Mexico, we would be in very much better shape than by any other method of control. Mexico will be a constant menace to us as long as the insect persists there. The political situation in Mexico is such that we can not do the work of co-operation in control action that we would like to do.

On the discovery of the pink bollworm in Mexico we immediately sent an expert, Mr. August Busck, to Mexico, even at a period when travel there was not without risk. The Mexican government promised much but did very little because, in part, of the disturbed domestic situation. It is evident for the present that it will not be possible to carry out any such clean-up program in Mexico as was done in Texas.

In Mexico the pink bollworm is limited largely to what is known as the Laguna region—a huge lake bed up in the mountains, two or three hundred miles south of El Paso. This ancient lake bed is some 50 miles in diameter and has proved to be an ideal place for cotton culture. The elevation is considerable, the climate is favorable, water for irrigation is available and enormous crops are produced. The Laguna is the great source of cotton in Mexico. In fact, there is comparatively little cotton grown in Mexico outside of Laguna. It is, from its isolation in the mountains, an ideal place for clean-up operations, and when the danger of interference from Villistas or other similar factors is removed Mexico may free herself from this pest.

In this Laguna region we have established an experiment station and for the last year and a half we have there been studying the habits and life history of this insect. This work is being carried on by two or three of our young men who are willing to take the certain element of risk involved in any work at this time in the interior of Mexico. I think it is fairly safe under present conditions and the risk is becoming less all the time. They are doing splendid work down there.

As already noted, we early established a quarantine against foreign cotton lint, and we have evolved methods for disinfecting bales of cotton. A bale of Egyptian cotton, baled under a pressure of 1,700 pounds to the square inch, rings like a board when struck and it is nearly as hard. The largest disinfecting plants are in Boston—others are in New York, San Francisco and Seattle. We import about $50,000,000 worth of long staple cotton every year. You will see from this that it is a pretty large proposition to disinfect all the cotton which enters the United States.

The prevention of new entry of the insect from Mexico has led to a control of the border commerce between Mexico and the United States. All rail and other traffic has, since 1916, been under the supervision of the Federal Horticultural Board. All cars and freight are cleaned and disinfected before they are allowed to pass the border. This is necessary because practically all Mexican cars are fouled with cotton seed and this seed becomes scattered more or less through the freight.

The disinfection of cars and freight has hitherto been by the pot method of cyanide fumigation.

To secure greater efficiency, we have just completed the erection of special fumigating houses at the five principal ports—El Paso, Del Rio, Laredo, Eagle Pass and Brownsville—in which cars and contents can be disinfected as entireties. These houses have capacities of from one to fifteen cars at a time and are equipped with special apparatus for generating, distributing and expelling the gas. The fifteen-car house is probably the largest disinfecting plant so far constructed. It is expected that at least $100,000 worth of cyanide and acid will be required for this work each year.

If we are successful in exterminating the pink bollworm in Texas and preventing its further entry we will be the only great source of cotton which enjoys freedom from this insect, and we will have a great advantage over the rest of the world if we can maintain that freedom. The annual saving can be reckoned in the hundreds of millions! It is a stake worth fighting for to the utmost.

Having covered the general nature of the control work in relation to this insect, I will close by showing some slides that were sent to me this morning. Unfortunately, they do not illustrate the whole subject, but they will give an idea of some of the details of the work.

(Mr. Marlatt here shows a number of slides projected upon a screen.)

THE CHAIRMAN: I am going to ask two questions of you representatives of the different states. Have we benefited by Dr. Marlatt's coming to the Riverside Convention? You know he has taken two weeks of his valuable time and he has given us most valuable information. Have we benefited by his presence here? Now shout!

(The Convention shouts.)

THE CHAIRMAN: Are you willing to back him up to the limit in his federal quarantine work?

(Unanimous approval by the Convention.)

THE CHAIRMAN: I have a letter here, brought by Mr. Pellegrin, who is the personal representative of Governor Cantu, of Lower California. I would like to have Mr. Pellegrin and also Mr. Pratt who comes with him give us Governor Cantu's message. I take great pleasure in introducing Mr. Pratt, who will also speak for Mr. Pellegrin.

MR. O. A. PRATT (Lower California): *Ladies and Gentlemen*—Perhaps I occupy a rather unique position. I am an American, but I am here as the representative of the Camara Agricola of Mexico and the government of Lower California. I think it might be well to say a few words in my capacity as an American citizen rather than as a delegate from the government of Lower California, because I would like to tell you something about these people. Mr. Pellegrin is too modest to say what he knows to be true. The Mexican people are, as a rule, peaceful

people, like the Americans. You will bear in mind that Baja California is a new state, or rather, a territory. It has not yet been admitted to statehood in the United States of Mexico. It is governed in a way corresponding to the territorial government which once existed within the continental limits of the United States. It is a new country. Approximately six years ago it was overrun by bandit bands, revolutionists, Bolsheviki, and I. W. Ws. who had invaded the country and declared Lower California an independent state with an American criminal, Dick Ferris, as president. Then came Colonel Cantu at the head of a group of patriotic Mexican soldiers, who fought his way into the country and drove these freebooters out or killed them. The advent of Governor Cantu and his final elevation to the governorship of Lower California marked the beginning or rather the re-establishment of a stable form of government, law and order; in fact, the rebirth of the northern districts of Lower California. Then, attracted by the promise of peace and prosperity, the Mexican people from all parts of revolution-torn Mexico began to arrive. Mexicans from Mexico City, Vera Cruz, Guadalajara, Chihuahua, Sonora, and the west coast, by one, by families and by parties, came to Lower California to begin life anew. Many of them came leaving behind them the greater portion of their goods, their wealth of cattle and money. Some of them left all. But, gentlemen, they brought something with them—another kind of wealth which ultimately counts for more than glittering gold or fine raiment. They brought with them character, and armed with this and such capital as they had saved from the wreck of revolution, they began the struggle against the desert under the burning rays of the more than tropical sun. Since the coming of these people Lower California has changed into a progressive state, small but flourishing and prosperous, with modern school buildings and facilities second to none. They have modern highways. The export business of the past year was valued at approximately $10,000,000. This is the accomplishment of less than ten years. The border conditions of southern California, between the northern district of Baja California and Alta California, are ideal. I think it is perfectly safe to say that there is no frontier between any two sections where a finer spirit of cordiality and friendship exists than along the boundary line which divides this state from Lower California. Mexicans and Americans live side by side, do business, mingle together in social and business ways as two good neighboring families might live together on the same street, co-operating in perfect harmony. These conditions are due in large measure to the attitude of Governor Cantu, and to the general character of the Mexican people who have made up this Mexican state. It is with these people that the United States Department of Agriculture and the departments of agriculture in the various states will have to deal in the matter of co-operative plant protection, and I feel sure, judging from the character of these people and knowing them as I do, that you have nothing to fear from them, and if there does not exist in Lower California an elaborate system of plant quarantine, inspection and service, it is because the country is new and because of the peculiar economic conditions obtaining in Lower California, which have not, up to the present time, seemed to demand such a system as we now have in the United States.

And now, if I may assume myself to be a Mexican, I speak to you for a few minutes as a delegate from the Lower California government and the Camara Agricola Mexicali. Those that come from farther north may not be as familiar with Lower California as those of us who live along the boundary. The northern district of Lower California is a state perhaps about the size of the state of Kansas, some 200 miles wide on the north and 150 on the south, and perhaps 300 or 400 miles in length, bounded on the north by the State of California, on the west by the Pacific Ocean, on the south by the southern district of Lower California, on the east by the Gulf of California or Gulf of Cortez, and the states of Sonora, Mexico, and Arizona of the United States.

Our principal ports of entry are Ensenada on the Pacific Coast, a beautiful little city with an ideal harbor, but with no railroad connecting it, and consequently, as a port of entry, it fills no important role. On the south there are no ports of entry because of the mountainous condition of the country. On the east is a port of San Felipe on the Gulf of California, which has recently been opened up, but it has no railway connection. A wagon road, winding across the desert in the sand dunes, finally reaches Mexicali, so that until a railroad is put in through this country San Felipe will have no great harbor. A small boat from time to time brings products from Old Mexico to Eastern Mexico, but the things brought by this boat must be of light weight and of high value in order to pay for their transportation across the desert to the places of marketing. Such products as liquors, tobacco and dried meat are brought in this manner. Then on the north the ports of Tia Juana, Tecate in the mountains, and Mexicali, opposite Calexico. Tia Juana also is of little importance because the commodities used by the local population are imported. From Tecate, wheat and wheat flour are exported; beans are exported from Ensenada and from Tecate. About seven months in the year there is a constant stream of cotton coming out of Mexicali and going into the United States. Something like 54,000 bales of cotton were imported into Calexico from Mexicali during the season just closed. From the port of Mexicali are exported also alfalfa hay, milo maize, a little barley, wheat, and this year we may have some rice. You might say Baja California derives its revenue primarily from exports, its people living by selling their products in the foreign market. The imports consist only of manufactured goods which are needed in the territory, and these come through the United States. We are dependent for our manufactured products on California, and we sell our products in the United States. So much for the geography and the general economic conditions of the country.

Now, in regard to the products which are produced there. We raise cotton, corn, milo maize, barley, alfalfa, some wheat, this year a little rice, and on the Pacific Coast, beans and wheat. Now, in regard to quarantine regulations. Lower California has just one plant quarantine. It prohibits the entry of cotton and raw cotton products except through two ports, both of which are on the border. To import cotton products in the northern district it is necessary first to procure a permit from the Governor's Office. The application for the permit must show the amount of seed or cotton products to be imported and the place where the cotton is grown. The government also requires that the application

shall be accompanied by a certificate of inspection from a properly qualified American inspector, showing that the cotton seed or the cotton product has been inspected and found to be free from such cotton pests as the bollweevil and pink bollworm. This, in effect, really prevents the introduction of cotton seed or cotton products into the northern district of Lower California, except as it comes from the United States under the control of the United States Federal Quarantine Board, and the various state quarantine bodies. Incidentally, I have inspected the cotton of Calexico, and I have assured Mr. Waite of Imperial County that no cotton would be permitted to be certified which was not imported into Imperial County after strict inspection. In regard to other possible plant quarantines, the Governor of Lower California has been studying our situation during this past year. He has copies of the various quarantine laws of the United States, the Horticultural Board of the State of California, and those of other states. He has been making a study of the various quarantine systems with a view of being in a position to handle any condition that should arise. It may be that it will be necessary to quarantine even against some portions of the United States on account of the alfalfa weevil and the diseases of wheat, because both of these are important crops in Lower California.

Mr. Pellegrin and I were sent here to get information to take back to the Camara Agricola and the Governor's Office, that they may be in a position to know what is being done at the present time. The Camara Agricola Nacional is an organization formed in accordance with the laws of Mexico. It is not a department of the government, but it makes recommendations to the government and sends delegates to both the central government and the local government.

In Baja California, the Camara Agricola is almost the mouthpiece of the local government in an agricultural way. It was organized by Governor Cantu himself, who is an active member. The president of the body, Guillermo Martinez de Castro, is a very intelligent man who is engaged in growing cotton. It would be through this body that the American departments of agriculture can work. Mr. Pellegrin and I came here with explicit instructions from the Governor's Office and the Camara Agricola to assure you gentlemen that you can depend on the co-operation of Lower California in whatever way possible. They invite you to send suggestions. Such suggestions will be received in the spirit in which they are sent and co-operation will be forthcoming in every way. I believe that is all. I thank you.

THE CHAIRMAN: I believe we are all gratified to have Governor Cantu send two such able men as his representatives. I will have to attend a meeting at 3.30, and I would like to ask Mr. Marlatt to take the chair.

CHAIRMAN MARLATT: Just a word. I wish to say that Mr. Pratt recalled to my mind one of the things that I omitted in my hasty review of the cotton situation, namely, that we do admit cotton from Lower California. Cotton culture is continuous between Lower California and the United States. There is, therefore, no object in establishing a quarantine line, because if infestation comes on one side it is bound to be on the other. We have to treat that country, as far as quarantine is concerned, as if it were part of the United States. We have restrictions

on cotton and cotton seed from that district, but they are not restrictions which prevent the passage of cotton. They are based on the maintenance of this very control by Lower California that Mr. Pratt has described.

The next order of business is "Interstate Quarantine on Potatoes," which is to be opened by Mr. Dean of Olympia, Washington.

INTERSTATE QUARANTINE ON POTATOES.

By M. L. DEAN, Olympia, Washington.

There are a few points which I wish to bring out in connection with the enforcement of quarantine from the standpoint of the economic relations or economic advantages between states. It is a question of construction rather than destruction. I believe that a quarantine measure, equitably adjusted, properly applied, is an economic problem which should be given the most careful consideration, and I believe that the result of our deliberations here will be that as states we will get more uniform quarantine regulations, which is bound to be a great benefit and an advantage to all of us. While quarantine officer of the state of Montana, we came in touch with the alfalfa weevil situation upon its first outbreak in the state of Utah. The state of Montana immediately made quarantine regulations, drastic to say the least, and we were among those people that Brother Hagan mentioned, because we found, after coming into conference at Salt Lake City year after year as we did with other quarantine officials of adjoining states, that we had made mistakes and, after investigating the fields and going over those sections of Utah as we did, that were infested, we found problems entering into quarantine regulations which were beyond human power to control. Natural conditions in a measure would solve them in all operations between states. The question of quarantine relative to potatoes between states is no different than that of any other commodity. We have to protect ourselves from an infestation which has made some states in the West take precautionary measures against the introduction of a pest that seriously attacks certain commercial interests. In the North we have a market for California potatoes. We want them for our own people. We want them to distribute through our commission houses and our brokers and our dealers to that immense trade in Alaska. We can not grow potatoes to supply that demand, consequently we look to the southern producing centers for the crop. But behind that we do have a potato interest in the state of Washington which represents millions of dollars, and we do not believe that we can jeopardize that interest by allowing the infested product to enter our state without proper regulation. For that reason we have not placed a direct embargo upon California potatoes, but we have a conditional quarantine whereby they may be received into our state. Possibly we are adopting unique measures in sending one of our inspectors to the shipping sections of California. We have done this for the past five years and I wish to emphasize that point because I know that we have been criticized for our standing in the matter. I know that there has been criticism that we do not recognize the ability of the inspection force of California. Forget that idea. We do recognize it. We know that the inspection force of California is just as competent to pass on these questions as any inspection force that we can send down here. But the dealers in California in Los Angeles, in Sacramento, in Portland, in all of our chief cities, urge upon us to take this precautionary measure in order that it may give an added security against any possible introduction of infested stuff. We first sent a man to investigate the situation relative to the potato tuber moth. Infested shipments came into our market which, because of their condition, were confiscated, causing a loss to the men who sent them there—the dealer, the broker, the commission merchant, whoever he might be. This loss eventually fell on the grower who produced the potatoes. Because of that fact, I say there is an economic situation which careful quarantine measures may regulate so that they add a protection not to be secured under other conditions. Further, it places that protection in the right place—at the point of production. The following year our men came into the field and inspected 80 different carloads of potatoes and passed 65, rejecting the balance. In 1917, we inspected 125 carloads, passing 90. In 1918 we inspected 275 carloads.

passing 206. So that we see a natural increase in the volume of business because of that quarantine regulation. It has not injured the trade. It has not injured the volume of business, but it has stimulated it, and made it a safe proposition. So I believe that this is an illustration which proves beyond any question that proper quarantine regulations, applied as they may be, are a stimulus and a benefit to any avenue of trade or commerce. There are other points that we could take up along that line. I touched upon one just before lunch. I believe that federal authority could assist us in getting better control of some of our transportation companies. We can not as states reach out into interstate commerce and get regulation. But when that hand of federal control reaches out and says to any corporation or any company what they shall do, they do it, and in that way, as I said before lunch, Mr. Marlatt, I do believe that the Federal Quarantine Board could appeal to the Interstate Commerce Commission and, in the adoption of their regulations, assist us in the control of shipments from quarantined sections of what we might call contraband stuff. I believe that after the discussions we have had here for the past two days, that we will all look at quarantine and quarantine regulations in a far different light from what we would have done had we not attended this very interesting and instructive meeting.

THE CHAIRMAN: We will now hear from Mr. Park, representing Oregon.

MR. C. A. PARK (Salem, Oregon): *Mr. Chairman, Ladies and Gentlemen*—Oregon produces about nine to thirteen million dollars worth of potatoes a year. We, like Washington, are particularly anxious to keep out of the state any pest that will increase the labor of producing potatoes. Our principal quarantine is against California, on account of the tuber moth. We are contending very strenuously against the tuber moth because it is too dangerous a pest to have introduced. We want California potatoes inspected and a certificate to accompany each shipment.

We have several quarantine stations in Oregon, among them being Medford, Roseburg, Eugene, Salem, Portland and Astoria. Those points make it rather easy for shippers to get into the state with their products.

MR. GEORGE M. LIST (Colorado): *Mr. Chairman, Ladies and Gentlemen*—We have a restricted quarantine against California on account of the potato tuber moth. That is the only quarantine we have in effect relating to potatoes. Before the quarantine was put into effect, Colorado was somewhat of a dumping ground for infested potatoes from California. There is a question in our minds as to whether the potato tuber moth is going to be a serious pest in sections farther north. I think it is a question in the minds of many of the entomologists that have had experience with it. It is very doubtful that it will be, judging from our experience. There is no doubt the potato tuber moth has been coming into Colorado for ten years or probably longer. I don't know how long it has been in California. No doubt it has been here for a long time. But there is only one case on record where the potato tuber moth has been reared from a crop in Colorado, and that was from a plant at Rocky Ford, Colorado, reared by the late Mr. Harold Marsh of the Department of Entomology. The law gives us the power to destroy infested material or to allow the owner to ship it out of the state. We have found a number of cars coming in infested. Shippers have diverted them to Kansas, Oklahoma, Nebraska and other points. That, in a way, is not protecting Colorado. We have a quarantine against California, yet we are sending the pest into Oklahoma and

Kansas, and we have a quarantine against those states. If it becomes established in those states, it is only a question of time when it is going to get over into Colorado, probably worse than it does from California. It illustrates our lack of co-operation and things that we are doing that do not give the results we think we are getting simply because of this lack of co-operation between states.

MR. EHRHORN: I think the tuber moth came from Australia in early days.

MR. MASKEW: There is a much mooted question as to where the potato tuber moth came from into California. To the best of my knowledge and belief, what we call Irish potatoes are native to the Indian plateaus. The tuber moth is very common there. The first Irish potatoes that were brought into California were brought from the Indian plateau from the port of Chile by the great French scientist La Perouse, when he made his voyage around the world. He says in his diary, "I made a present of a number of potatoes to the missionaries at the port of Monterey and advised them to plant them." There was no practical quarantine officer there to see if tuber moth was there or not, but they came from a tuber moth region. This was the first introduction of Irish potatoes into California, and the tuber moth is especially bad in the region of Monterey. I have endeavored to run this rascal down for many years.

MR. WICKS: I am here representing our quarantine work. We are vitally concerned in the importation of potatoes that may be known to carry the potato tuber moth. I have a letter from our deputy inspector at Twin Falls stating that in a shipment from California he was able to get 18½ pounds of potatoes that showed unmistakable signs of potato tuber moth. We have quarantined rigidly against California, Texas and Florida potatoes. Our quarantine order does not allow any potatoes to come in from those three states. Unfortunately we find that potatoes from California are entering through Utah points. This happens to be entirely due to transportation. We find that our staff of Idaho inspectors have to watch potato importations very carefully. The railroads are for the most part unaware of the situation, and sometimes indifferent.

I am glad to say in behalf of the railroads, that after I issued a letter to them in regard to this matter, they signified their intention of co-operation, and since the first of April we find a thorough and hearty co-operation.

THE CHAIRMAN: The subject is now open for general discussion.

MR. SPRAGUE: I would like to ask if there is any prospect of cleaning up the California tuber moth?

MRS. HILDA B. NIELSEN (California): It is hard to have to sit down here and keep still.

THE CHAIRMAN: You have your chance now.

MRS. NIELSEN: We need inspection for this state and we want California to regain her wonderful reputation, but I do think that our visitors have laid undue stress on the tuber moth. In Sonoma County, we had the tuber moth about five years ago, and the earlier settlers think they saw it years before that. We grow certified potatoes. There is one field 5½ miles from home, that we took an inspector over to and found it very badly infested with tuber moth. Of course, we did not

get any certification. We thought at that time that our business was ruined. Even for the coming year we planted our potatoes and did not ask for an inspection, because we didn't think we could have it. We thought we must dig them early and sell on the local market. However, in the last four years there has not been a tuber moth.

That winter we had a very unusual weather condition. Snow fell three inches deep and remained over a week on the ground. A month later we had snow again, five inches deep on the ground for a couple of days. We thought it must have been the cold weather that froze them out, for we have never seen them since.

MR. EHRHORN: Did the ground freeze?

MRS. NIELSEN: Oh, yes; a little bit.

MR. EHRHORN: An inch?

MRS. NIELSEN: Not quite.

MR. EHRHORN: Were there many potatoes in the ground that were infested?

MRS. NIELSEN: The potatoes are all dug up. Everything is used for stock feed. Our potato growers dig up everything. As a potato grower I admit that we can not get every potato, but we get most of them.

MR. EHRHORN: What is the soil where you are planting?

MRS. NIELSEN: Sandy loam.

MR. EHRHORN: Have you much wind?

MRS. NIELSEN: Our trees all lean one way.

MR. EHRHORN: I don't know much about the life history of the potato moth, but I have read a great deal and I have heard a great deal in regard to the way the moth infests potatoes in the field. If you have a very sandy soil which can be easily removed from the potato by wind, thus exposing the potato to the sun, you have more potato moth than you would have if the potatoes were better covered. If you have potatoes in a heavy adobe soil and the soil cracks open, you will have more moth in that soil than where the potatoes are entirely covered up. I think the main thing in a potato proposition is the lack of a thorough study of the insect and its life history. I have seen the moth and I have seen potatoes infested. Invariably I found out that it was caused by the exposure of the potato about the surface of the ground or in cracks.

MR. DEAN: I wish to emphasize what the brother said about the potato growing next to the top of the ground. In our carload inspections which come into Seattle from other points, we would always look at the top potatoes the first thing, and if there was any tuber moth in the shipment, those were the potatoes in which we found them. I believe if the growers of California would grow the potatoes right, as our sister brought out here in the potato meeting, that a large part of this trouble would be eliminated. If the tuber is exposed to the air, as Mr. Ehrhorn said, or allowed to lie on the ground exposed for any length of time before being placed in the sacks and gotten out of the way, then watch out for your infestation. Sometimes we have cars on the road to exceed three weeks, between California and Seattle. One car which our inspectors passed upon when it came into our ports, we found in a very bad condition, when it was apparently free from moth

in California, showing that the moth had in that interim infested the potatoes until they were in a condition where we could not use them. For that reason we demand that all shipments must be made in cold storage cars. The question of fumigation was brought up. Last year we fumigated where we found a few moths in the cars. We did not injure the potatoes, but we destroyed the active moths. We found numerous larvæ of the moth in the potatoes and a good many of them were dead.

THE CHAIRMAN: You say that last year you found a car inspected in California before shipping and found plenty of moth in Seattle?

MR. DEAN: Yes. We found that condition in a car that had been in transit for three weeks.

MR. SPRAGUE: I wish to add the results of my observation of some potatoes dug last September which will controvert somewhat the observation of the gentleman who has spoken, of the potatoes being particularly safe if they are not near the top of the ground. I saw these potatoes dug and there was hardly one out of twenty but what was infested with the tuber moth, and those potatoes were, most of them, from four to six inches from the surface of the ground, so that I do not believe that we can depend on that as a protection.

THE CHAIRMAN: What was the nature of the soil—was it dry and broken up?

MR. SPRAGUE: No; it was a good loam, not a sandy loam but a loam that did not crack and not lumpy. It was a good potato soil.

THE CHAIRMAN: When did you examine the potatoes, right in the field?

MR. SPRAGUE: In the field as they were being dug.

MR. LIST: I got some shipments in Denver that were so badly infested that we turned them over to the pure food inspector, who destroyed them on account of being unfit for food, and they were equally as bad as the shipment this gentleman speaks of. There was hardly one potato out of twenty that did not have from one to five larvæ in it. Either they were infested in the field or the shipment was on the road long enough for the moths to deposit eggs. They might have deposited eggs on the tubers at digging time.

MR. MACKIE: I think some of these potato growers do not appreciate the short time it takes for the moth to get in and lay eggs. I think that a few hours exposure gives an opportunity to the moths to lay their eggs.

MR. A. KIMBALL (Arizona): Would not shipping potatoes in refrigeration kill the larvæ and leave the potatoes free from moths?

MR. DEAN: I can not say.

MR. EHRHORN: How cold is the temperature?

MR. DEAN: I don't know, but they are shipped under ice.

MR. SPRAGUE: From experience in examining the degree of refrigeration in cars shipped under ice, I suggest that it is very seldom indeed where the temperature goes below 55 degrees in a car unless it is very cold weather.

MR. EHRHORN: In that case I wouldn't think it would affect the moths at all.

MRS. HICKMAN (California): Monterey County is one of the greatest potato counties and it is afflicted with the tuber moth. What are we going to do unless, by some legal means, we can get at the growers and insist upon their production of good potatoes, and where are they going to get the seed? We very rarely raise a crop but what we have some trouble and it is almost impossible to get good seed, and yet potatoes are so in demand that we can not afford not to do it.

MR. SPRAGUE: I am sure I voice the sentiments of the other growers in this state in raising the inquiry: why is it that so serious an infestation as this of the tuber moth has been permitted to continue without more active effort in California to restrain it or eradicate it?

MR. HECKE: I believe it is due, as Mrs. Hickman says, to the fact that clean seed has not been obtainable for several years. We have recognized it and have submitted a bill to the legislature which was passed by the senate and the assembly. It now awaits the Governor's signature and provides for certified potato seed. I believe, with closer inspection, we can improve the situation. We must admit that, due to these causes, the potato industry has suffered in California. We are going to do our best to improve conditions both by better seed and by better inspection.

MR. SPRAGUE: Have our authorities made a study of the life history of the moth?

THE CHAIRMAN: We expect to do that, but special study must be made by the University of California. We have an understanding with the University of California by which all the research work is done by the College of Agriculture of the University.

MR. SHARP: I would like to ask if there is a method that might be adopted to treat these carloads of potatoes before they leave the State of California to go into any other state or leave any other to come into the State of California, that will make them safe—that will destroy the eggs and the moth?

THE CHAIRMAN: Can any gentleman answer this question?

MR. MACKIE: I would venture the assertion that if the potato fields were given better cultivation and covered up more to keep the potatoes from being exposed, and covered up at night, that not 50 per cent of the tuber moth infestation would exist.

MR. KIMBALL: I hope that before this Congress adjourns, we shall resolve upon some method that will assure a more rigid and perfect system of quarantines all over the country, international and otherwise.

MR. MARLATT: I have not made a special study of the tuber moth, but it is being studied by the Bureau of Entomology and I think some work is being done in California. My recollection is that this tuber moth, according to the belief of our specialists, is identical with the tobacco insect. Our specialists believe that the two are the same. If that is true, that these and other insects are the same, the potato moth is undoubtedly widespread throughout the United States, or at least, the southern half and the west coast. It is therefore an insect the extermination of which is surrounded with difficulties at first glance insurmountable. If it were an insect confined to California here, or to two or three states, it would be subject to control operations just the

same as we are carrying out with the pink bollworm; because there is an insect newly introduced which affords an opportunity for effective work. As we see it now, the potato moth has been in this country for many years. We have records in the South as to tobacco insects. There is still a question as to whether the two are identical, but we had a hearing on the subject of the potato moth within the last year or two to determine whether it was practical to accomplish something by means of quarantine, and the evidence that was presented by Dr. Hunter, representing the tobacco research work, and Dr. Chittenden, representing the potato, seemed to indicate that the insect was widespread, but that it attacked potatoes seriously only in certain districts. I was trying to determine whether soil conditions were not controlling factors in potato injury because if the potato moth occurs through Tennessee and Kentucky and in the South, it is not known as a potato pest there. It must be that the soil conditions or the moisture conditions control it. Up in Maine and throughout that country, very likely the climatic conditions control it, but east of the Rocky Mountains it is a negligible pest. It must have been found in Colorado many times, for Colorado was the dumping ground for infested potatoes, and yet it failed to become established. Possibly the cold winters may be a controlling factor there.

MR. SPRAGUE: I grew potatoes in the Brownsville district in Texas for several years. Many hundred cars were shipped from there and I never saw any evidence of potato moth in that district. There is something resembling it in the sweet potato. Sweet potatoes are badly infested, Irish potatoes are not infested, and I wish to ask for a suspension of judgment by the gentlemen here as to the identity of those two insects. Be sure that we draw no wrong conclusions.

MR. ESTES P. TAYLOR (Arizona): Three years ago I was connected with potato work in Idaho. I was called to Pocatello to inspect a car of potatoes received from Brownsville, Texas, supposed to be infested with potato tuber moth. I found the tuber moth very serious in that car. The carload was destroyed at Pocatello. That shipment was from the Brownsville district and the potatoes were Red Triumph.

MR. SPRAGUE: What time was this shipment received?

MR. TAYLOR: About three years ago.

MR. SPRAGUE: Are you sure it was from the Brownsville district?

MR. TAYLOR: It was reported as from the Brownsville district.

MR. WICKS: I happen to have a bulletin from Dr. Chittenden. If the secretary will read it, it might explain these points very nicely.

MR. HAGAN: Farmers' Bulletin No. 557, "The Potato Tuber Moth," by Dr. F. H. Chittenden, October, 1913, page 1:

"For many years the potato tuber moth has been the worst potato pest in California. It has now reached the state of Washington and southern Texas and menaces adjacent states. This insect feeds also upon tomato, eggplant and tobacco."

(On page 2 of the same bulletin.)

"As an enemy to tobacco it has been known for several years in Florida and in North Carolina, South Carolina and Virginia. * * *"

"As an enemy to the eggplant and ground cherry it has been observed as far north as the District of Columbia."

THE CHAIRMAN: While our program is coming to an end this afternoon, that does not prevent the representatives of the Western States meeting tomorrow, Thursday or Friday to discuss alfalfa weevil, potato tuber moth or whatever other things are bothering us. There will be an opportunity to meet here every day, and I would strongly recommend to you not to close the conference this afternoon, but meet again this evening in the private office opposite the door, and for fifteen or twenty minutes make out your program for the next day or two, and stay with it until we have solved this vexatious question. That will give your "committee of five" an opportunity to work out a good plan of organization.

(*The regular program of the Western Plant Quarantine Conference was now completed and an adjournment was declared until the following day when the quarantine officials of the Western States were to meet for informal, roundtable discussions.*)

Inspectors Station, International Bridge, Brownsville, Texas.

WRITING THE MAGNA CHARTA OF PACIFIC COAST QUARANTINE.

Members of committee of Western Plant Protective Board. From left to right: Frederick Maskew, in charge of California quarantine; M. L. Dean, Olympia, Washington; C. A. Park, Salem, Oregon; W. H. Lyne, Vancouver, B. C.; H. R. Hagan, Salt Lake City, Utah; W. H. Wicks, Boise, Idaho. (Courtesy "California Cultivator.")

THE FORMATION OF THE WESTERN PLANT QUARANTINE BOARD.

By HAROLD R. HAGAN, Salt Lake City, Utah.

The quarantine officers of each of the states represented met Monday evening, May 26, 1919, at the suggestion of Mr. G. H. Hecke to consider the common problems of the Western States.

Roll call by states showed the following states represented:

Arizona	Oregon
California	Utah
Colorado	Washington
Idaho	Territory of Hawaii
Montana	Province of British Columbia

A temporary organization was formed to transact the business before the representatives of the Western States and to present plans for a permanent association.

Dr. E. P. Meinecke was requested to read the resolution of the Portland White Pine Blister Rust Conference. (These resolutions appear in the regular program of the Plant Quarantine Conference.) After formal motion the resolutions of the Portland White Pine Blister Rust Conference were adopted by unanimous vote of the delegates present.

Mr. W. H. Wicks of Idaho then made a motion that "we proceed to organize a Western Plant Quarantine Association, composed of the authority invested to enforce the quarantine regulations of the Western States, the Territory of Hawaii, the Province of British Columbia and the District of Lower California." This motion was seconded by Mr. A. L. Strausz of Montana and passed. A committee was appointed to draft the plan of organization to be submitted for adoption at a later meeting. The committee consisted of Messrs. C. A. Park (chairman), M. L. Dean, Frederick Maskew, W. H. Wicks, W. H. Lyne and H. R. Hagan (secretary).

On the afternoon of May 28, 1919, the special committee reported to the quarantine officers of the Western States assembled in regular meeting and submitted the following constitution and by-laws for consideration:

Constitution and By-laws of the Western Plant Quarantine Board.

PREAMBLE.

We, the plant quarantine officials of the Western States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming and the Territory of Hawaii, District of Lower California and the Province of British Columbia, here assembled in the First Western Plant Quarantine Conference at Riverside, California, May 26 to 31, 1919, for the purpose of discussing quarantine questions, pertaining to promulgating and enforcing our various regulations, believing that uniformity of action is conducive to better results in our work deem it advisable to form an organization for our mutual co-operation and understanding. For this purpose, we hereby adopt the following Constitution and By-laws.

CONSTITUTION.

ARTICLE I.

SECTION 1. *Name.* This organization shall be known as the Western Plant Quarantine Board.

SEC. 2. *Members.* This board shall be composed of the plant quarantine officer from each of the following states, territories, provinces and districts:

1. Arizona.
2. California.
3. Colorado.
4. Idaho.
5. Montana.
6. Nevada.
7. New Mexico.
8. Oregon.
9. Utah.
10. Washington.
11. Wyoming.
12. Territory of Hawaii.
13. District of Lower California.
14. Province of British Columbia.

ARTICLE II.

SECTION 1. *Purpose.* It shall be the purpose of this organization to secure a greater mutual understanding, closer co-operation and uniformity of action for the efficient protection of our plant industries against plant diseases and insect pests.

ARTICLE III.

SECTION 1. *Officers.* The officers of the board shall consist of a chairman, a vice-chairman and a secretary-treasurer. The tenure of office shall be two years, or until their successors are elected and qualify, which officers shall compose the executive committee.

BY-LAWS.

(1) This board shall be governed by Robert's Rules of Order, when convened.
(2) The officers shall be elected by ballot, as soon as this Constitution is adopted, and each alternate year thereafter.
(3) The regular meetings of this board shall be held on the first Monday in May each year.
(4) The place of meeting shall be designated by the executive committee, at least thirty days before the regular meeting.
(5) The duties of the officers of this board shall be such as are ordinarily performed by similar officers.
(6) The official action of the board shall be exercised by the executive committee during the interim between meetings.

The Constitution and By-laws of this Western Plant Quarantine Board are hereby adopted in regular session of the board at Riverside, California, this twenty-eighth day of May, 1919.

Arizona	Andrew Kimball
California	G. H. Hecke, Frederick Maskew
Colorado	George M. List
Idaho	W. H. Wicks
Montana	A. L. Strausz
Nevada	Edward Records (July, 1919)
New Mexico	J. W. Knorr (September, 1919)
Oregon	Charles H. Park
Utah	Harold R. Hagan
Washington	M. L. Dean
Wyoming	James P. Poole (July, 1919)
Territory of Hawaii	Edward M. Ehrhorn
District of Lower California	O. A. Pratt (July, 1919)
Province of British Columbia	W. H. Lyne

Following the adoption of the Constitution and By-laws, Mr. G. H. Hecke of California was elected Chairman, Mr. C. A. Park of Oregon was elected Vice Chairman, and Mr. H. R. Hagan of Utah was elected Secretary-Treasurer of the Western Plant Quarantine Board.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF JULY, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	63
Passengers arriving from fruit fly ports	3,406

Horticultural imports:

	Parcels
Passed as free from pests	70,888
Fumigated	1,191
Refused admittance	44
Contraband destroyed	45
Total parcels horticultural imports for the month	72,168
Sterilization (empty containers)	1,825

Pests intercepted.

From Central America:

Pseudococcus sp. and *Aspidiotus* sp. on bananas.

From Hawaii:

Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Weevil (undetermined) in seed pods.

From Japan:

Lepidopterous larvæ in peanuts and beans.

From Mexico:

Coleopterous and lepidopterous larvæ in Guamuchil seeds.
Lepidosaphes beckii on limes.

From Oregon:

Scab and Rhizoctonia on potatoes.

From Peru:

Larvæ of weevil (undetermined) in potatoes.

From Tahiti:

Lepidosaphes beckii and fungus (undetermined) on oranges.
Pseudococcus sp. on croton plants.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	30
Fish boats inspected	5
Passengers arriving from fruit fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	55,917
Fumigated	13
Refused admittance	2
Contraband destroyed	15
Total parcels horticultural imports for the month	55,947

Pests Intercepted.

From Arizona:

Chloridea obsoleta in green corn.

From Central America:

Bruchus obtectus in beans.
Aspidiotus cyanophylli and *Pseudococcus* sp. on bananas.

From Hawaii:

Larvæ of *Bactrocera cucurbitæ* in cucumbers.
Pseudococcus bromeliæ on pineapples.

From Iowa:

Pseudococcus sp., *Coccus hesperidum* and *Hemichionaspis aspidistræ* on Boston fern.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	20
Fish boats inspected	43
Passengers arriving from fruit fly ports	14

Horticultural imports:

	Parcels
Passed as free from pests	3,465
Fumigated	0
Refused admittance	1
Contraband destroyed	0
Total parcels horticultural imports for the month	3,466

Pests Intercepted.

(None.)

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	6
Passengers arriving from fruit fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	6

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Volume VIII Number 9

MONTHLY BULLETIN
OF THE
DEPARTMENT OF AGRICULTURE
STATE OF CALIFORNIA

PLANT QUARANTINE INSPECTORS BOARDING A VESSEL TO SEARCH SHIP AND BAGGAGE BEFORE DOCKING.

SACRAMENTO, CALIFORNIA SEPTEMBER, 1919

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FUMIGATING PINEAPPLES BEFORE REMOVAL FROM THE DOCK.

A SERVICE THAT IS EQUAL TO THE OCCASION.

"NO NEW INSECT PESTS OR PLANT DISEASES OF MAJOR IMPORTANCE ARE RECORDED AS HAVING BECOME ESTABLISHED IN CALIFORNIA."

THE MONTHLY BULLETIN

DEPARTMENT OF AGRICULTURE

STATE OF CALIFORNIA

DEVOTED TO AGRICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

G. H. HECKE, Director ..... Censor

BRONTE A. REYNOLDS, Assistant Secretary ..... Editor

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Vol. VIII | SEPTEMBER, 1919 | No. 9

ROLL OF HONOR

"The Great War"

☆

STATE COMMISSION OF HORTICULTURE
COUNTY HORTICULTURAL COMMISSIONERS

☆

STATE COMMISSION OF HORTICULTURE

E. J. VOSLER* — C. P. CLAUSEN

HAROLD COMPERE — LEE A. STRONG

COUNTY HORTICULTURAL COMMISSIONERS

EL DORADO	JOHN A. WINKLEMAN
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SUTTER	ROSS KNIGHT
VENTURA	A. G. WICKLUND
	J. K. SALMON

*Died in the service, November 7, 1918.

THE NECESSITY FOR CO-ORDINATION OF EFFORT IN WEED CONTROL.

The ability of weeds successfully to persist and thrive in direct competition with other plant life is known too well by agriculturists.

Notwithstanding these great losses visited upon the farmer through the medium of weeds, but little active work, until recently, has been done toward eradication.

Weeds intrude themselves always where they are least desired and the various mediums through which they are introduced to new localities would read like fiction. They are introduced as impurities among other seeds and may carry the spores of fungous diseases; through the feed and excretions of traveling stock and horses from other states; by the flight of birds; or borne on the crest of flood and irrigation water; in trucks and railroad cars in which stock has been carried; on the hoods and tops of transcontinental trucks and automobiles; in manure, chaff, hay and threshing machines.

In order successfully to cope with the weed problem, a knowledge of the life history and habits is most essential, for while an "annual" may be completely eradicated in a given locality by destroying it before it matures and perfects its seeds, a "perennial" may not be so eliminated.

Persistent cultivation may destroy thousands of tiny seedling weeds, but it is not always possible to devote the necessary time and labor to this end. Certain chemicals have been recommended from time to time as efficacious weed destroyers, but many have their own peculiar disadvantages.

Plants of the thistle variety may be propagated anew through a small fragment of the root, each capable of producing another plant.

It is now becoming known more generally the great vitality and resistance of our common weed seeds, and most of them in their horny seed coats lie dormant in the moist soil, until some action brings them near enough to the surface to receive the benefit of the warm sun and air, which encourage germination. Experiments in England tend to show that weed seeds buried for periods as long as sixty years, are still viable and will germinate upon being brought to the surface.

Naturally the most reasonable method of weed control is suggested in the destruction of the seed crop, either mechanically with tools or by hand-pulling, and much valuable time would be saved by piling the wilted plants with combustible matter and destroying by fire, aided by a little oil if needed.

The proper time to destroy annuals and biennials by mowing is just before the blooming period, as the roots are then less vigorous.

Weed control, under present conditions, may be secured only by persistent, energetic work, and if land owners would co-operate, much could be done toward the successful accomplishment of the task.

Every farmer should exercise caution to prevent weeds and weed seeds from spreading from his own ranch or farm into clean and uninfested country.

This may be accomplished best through concerted action and promptness in destroying new outbreaks of noxious weeds as soon as they

appear. To neglect a given weed pest means proportionately greater loss when it reaches a point where necessity demands its removal.

An educational campaign involving weed destruction conducted as a part of school work throughout the state not only would have value in imparting a knowledge of botany which all should know, but would go a great way toward the eradication of many alien weed pests which contribute so largely to preventable economic losses of today.—G. H. H.

THE COUNTY HORTICULTURAL COMMISSIONER.

It is refreshing, and indeed an inspiration to the newcomer from outside the State of California to learn gradually, from day to day, of the seemingly small details which in collective form in a measure contribute to the state's agricultural supremacy.

As one becomes more intimately acquainted with the methods utilized by many of the county horticultural commissioners in the proper conduct of their respective offices, especially those features which relate to the educational side of their work, one is at once struck with the perfect application, and the true educational value, given at the right place and the right time to materialize the maximum results for good, if truly such results are to be accomplished by any means whatsoever!

Of prime importance throughout the state are the varied card index systems, which should be adopted by all county horticultural commissioners and by which it is possible readily to arrive at crop distribution and production figures. Then, too, in many counties the commissioners have fostered special press notices, to be printed in the local county papers, and small bulletins devoted to timely discussion of insect pests, insecticides and plant disease control.

Many of the more versatile county horticultural commissioners have accomplished much good through well-planned lectures, in many cases illustrated by stereopticon views. A large number of the county horticultural commissioners maintain in their offices exhibits which illustrate the noxious and beneficial insects, mammals, and birds either by colored pictures or preserved specimens; and in the more progressive counties some one is always available to answer questions and explain any knotty problem that may arise on a given subject.

The county horticultural commissioner of California must be a many-sided man. He must be actuated by two impulses: (1) to serve his state and county; (2) to promote and protect the plant industry of his state and county.

This is the "new era" of agriculture! The commissioner who arises in this laudable way to meet the emergencies and needs of his county surely will go down in the history of the state as a worthwhile man, and if we must lapse into some trite expression—"By their fruits, ye shall know them!"—B. A. R.

THE ENTENTE CORDIALE.

The county horticultural commissioners, through direct contact with the public, have an unusual opportunity to encourage effective co-operation between the fruit growers and farmers and the county and state authorities charged with the protection of their business. Adequate protection can not be secured without the fullest co-operation on the part of all concerned. The Department of Agriculture, through its Division of Plant Industry, is concerned primarily in giving the needed protection to the entire plant industry of the state and to that end desires to work hand in hand with the county commissioners. The interests of both are the same and it is only through their own hearty co-operation that the same spirit of harmonious co-ordination can be effectively passed on to the growers.

The experiences of the past make the new assistant to the chief of the Division of Plant Industry certain that the closest and kindliest co-operation will continue between his own office and those of the county commissioners.

Only through the development of this department to a point, in some measure at least, commensurate with the requirements can the plant production industries of the state hold first place in maintaining the agricultural supremacy and continued prosperity, not only of the farmers but of every other group of individuals in the other industries which are so completely dependent upon agriculture as a basis for their own success. The new office in the new department stands ready, therefore, to do its full share in co-operating to bring about these results.—R. H. T.

ON THE DOCK.

Inspecting Chinese sweet potatoes for the Sweet Potato Weevil (*Cylas formicarius*).

THE MONTHLY BULLETIN

CALIFORNIA STATE DEPARTMENT OF AGRICULTURE

Vol. VIII. September, 1919. No. 9

"SEEK AND YE SHALL FIND."

By A. C. FLEURY,[1] Los Angeles, California.

The first and probably the most lasting impression received by a horticultural quarantine inspector at our maritime ports, is the importance of small things. To the uninformed, one plant, one fruit, or a few seeds are not important; they bear no significance when compared with large commercial shipments of many cases of plants, and the avidity with which an inspector will dissect one little orange or other fruit often brings smiles and an inquiry as to what harm can come from a single fruit. Inquiry among the crew of a ship will often bring a response that they have no fruit. Search of their quarters will turn up several lots of two or three oranges each, but it was with no intention to deceive that they had replied they had no fruit; merely that they did not think we would be interested in two or three oranges. They did not realize that as much harm may come from one orange as from one thousand oranges.

Experience has shown that it is to the small things that we must look if our groves and gardens are to remain free from the many new and dangerous pests that constantly threaten to cross our threshold. It was not many days ago at San Pedro that an examination of the cool rooms of a vessel arriving from Honolulu, T. H., revealed the presence of a few cucumbers which had been taken aboard at Hawaii for use on the ship's table. Many had been used up on the trip, but a few remained. One very fine, extra large cucumber, probably 15 inches in length and 3½ inches in diameter, was noted wrapped in a piece of paper and set aside from the others. Inquiry developed the fact that it had been put aside by one of the cooks, and he volunteered the information that it being such a fine specimen he was keeping it to take ashore, and that it was his intention to keep the seeds until this next spring to have planted in his own garden. He could not understand why taking this lone cucumber ashore could do any harm. However, careful dissection of this same cucumber showed the presence of a number of live larvæ of the destructive melon fly (*Bactrocera cucurbitae*). Needless to say, no progeny of any of these cucumbers will ever be found.

No matter what occupation we follow, there seems to exist in us all a desire to produce something from the soil, to have a little garden, to grow a few trees; and it is this desire that leads many returning travelers from our insular possessions and from foreign countries, to bring back a few seeds, some fruit, or plants, or something that is novel and beautiful in the country from which they are returning, and which

[1]State Quarantine Inspector.

they hope to plant and duplicate here. Often do we find these persons bringing odd tropical fruits or seeds as curiosities to show their friends. A missionary returns from Chile bringing samples of extraordinarily large maize or corn; a mining engineer returns from Mexico bringing a half dozen avocado seeds; a lady teacher from Japan brings a small plant given her by her pupils, and all with never a thought that even through these few specimens may be introduced some new and injurious pest into our state and country. It is not always easy for these people to understand why they are sometimes refused permission to bring in things of this sort, especially when they have only a very few, although occasionally an incident occurs whereby we can show them the danger in a way that they can not fail to comprehend. On the morning of November 25, 1918, a vessel from Honolulu entered quarantine at San Pedro and in the course of a search of the rooms on the ship, in one was discovered several small branches of the coffee plant, bearing ripening berries. The occupant frankly stated that he had seen the coffee growing wild on one of the islands, and admiring the beauty of the ripening berries and impressed with the novelty of it, he had taken these few branches back to the ship, intending upon his arrival here to bring them ashore to his wife in Los Angeles and show her how coffee was grown. Examination of the coffee berries showed that practically every one was infested with one or more larva of the Mediterranean fruit fly (*Ceratitis capitata*), probably the most dreaded and worst known insect pest of fruit and vegetables that exists. We may only surmise what might have been the result had he carried out his intentions.

And so it should be realized that it is not only through large importations of horticultural material that the danger of introducing new pests lies, but from one plant, one fruit—yes, even one little seed—brought in by the unthinking or uninformed traveler, may come more damage to the agricultural interests of this country than may ever be offset.

EDUCATIONAL WORK ON PESTS IN SAN DIEGO COUNTY.

By G. R. Gorton,[1] San Diego, California.

For a number of years past the Horticultural Commissioner's office has been in the habit of staging exhibits at various horticultural shows, etc., where a large number of people interested in agricultural and horticultural matters would be likely to be present. These exhibits were commenced when Mr. H. M. Armitage was Commissioner of San Diego and have been continued ever since. The writer happened to set up the first exhibit of the sort which was held. The idea seemed to "take" with the public, who made good use of the information which was offered them and apparently profited thereby.

As is indicated by the accompanying illustrations we endeavored to show mounted specimens of the principal insects, diseases, rodent and weed pests, and the injuries wrought by them; also samples of insecticides, fungicides, chemical weed control, rodent poison preparations, fumigation equipment in miniature; formulas for their use are on the

[1]County Horticultural Commissioner, San Diego County.

same table as is this material, so they are readily available for distribution to whoever has need of them. At the last exhibit of this sort we showed mounted specimens of the California ground squirrels with

Fig. 123. A corner in the San Diego Educational Exhibit.

their burrows and a cross-section showing subterranean tunneling. We are constantly adding to our collection of mounted specimens with a view toward increasing the usefulness of these exhibits.

Fig. 124. The story of fruit growing and farming, noxious weeds, rodents and insects so graphically told that even the school child of the lower grades may grasp its meaning.

When the first few exhibits were held a careful record was kept of the number of inquiries made of the inspector who was in charge of the exhibit and upon what subjects they were, also the number of formulas distributed, etc. The exhibits have been seen by numbers varying from 2,500 to 8,000 people, so it is our belief that their influence is far reaching. It has always seemed to the writer that the value of "an ounce of prevention" is several hundred times better than a "pound of cure," and that a large portion of the Horticultural Commissioner's efforts might be saved if the public was forewarned in some such way as this.

Brief talks are also given from time to time for any gathering of people from whom a request comes, and sometimes we invite ourselves to talk. The public apparently has a consuming thirst for information along the line of pest control and the ignorance of a large percentage of people on such things is abysmal in its depths. Perhaps some time the State Department of Agriculture can arrange to maintain some form of Lecture Bureau to give popular lectures on Horticultural subjects in general and pests in particular. Such a service would seem to be of immeasurable value to the great mass of growers, ranging all the way from those who are concerned about the condition of one orange tree in their back yard to growers who have several hundred acres under their care.

PEAR ORCHARD, SANTA CLARA VALLEY—NOTE THE COVER CROP.

THE "YEMA" GRAFT OF THE VINE.

By LEON O. BONNET,[1] Berkeley, California.

All investigators have agreed that the methods of grafting resistant vines in the vineyard are much inferior to the methods of grafting the vines in the nursery before planting in the field. In spite of this, the majority of the growers continue to adopt field grafting instead of bench grafting, owing to the fact that bench grafting requires so much skill and experience that are difficult to acquire. For several years a new method of field grafting known as "Yema" budding has been used with great success in Australia. It seems to unite the simplicity of vineyard grafting with most of the advantages of bench grafting.

ORIGIN OF THE "YEMA" GRAFT.

The "Yema" graft originated in the vineyards in the south of Spain, where it is the preferred method used for establishing phylloxera-resistant vineyards. It has been well described by M. F. de Castella in The Journal of Agriculture of Victoria (1917) in articles upon which this article is based. "Yema" means in Spanish a bud or eye, so this graft might be termed "budding," though it is really a graft, for the eye used as a scion carries a good portion of wood with it. It differs from ordinary grafting by the great reduction of the size of the scion and the time at which it is practiced. Like ordinary grafting, the scion must be covered up after the graft has been made. Budding is performed on herbaceous shoots and above ground. The Yema graft is performed on nearly mature wood and below ground. Its main advantages are the high percentage of perfect unions obtained and the chance it gives of regrafting the few misses the following growing season—very high percentages (96 to 98) of successful grafts have been obtained.

THE GRAFT.

The principle which applies to all kinds of grafts, *i. e.*, contact of the cambium or growing layers of both stock and scion, must be observed with the Yema, but unlike most grafts this gives the best results when made in the latter part of August and during September. This method is quite elastic in its application and several methods have been described. When applied with care and skill all have given satisfactory results.

THE RUTHERGLEN METHOD.

In the Rutherglen method, the first practically applied in Australia, the scion is taken from a growing shoot or lateral by means of three cuts. The method of making these cuts is shown in figure 1. The first cut (1) is made at about a half an inch below the bud. The second cut (2) is made at a smaller angle with the axis of the scion shoot than cut (1). The third cut (3) a little above the second, and goes rather deep into the tissues, so that if the bud is looked at from below a yellowish spot of pith is seen on both sides of the diaphragm of the node of the shoot. Generally the scion so removed is slightly too thick and requires paring on the inner side. This operation should be carefully done so as to insure a plane surface.

[1]Division of Viticulture, College of Agriculture, Berkeley, California.

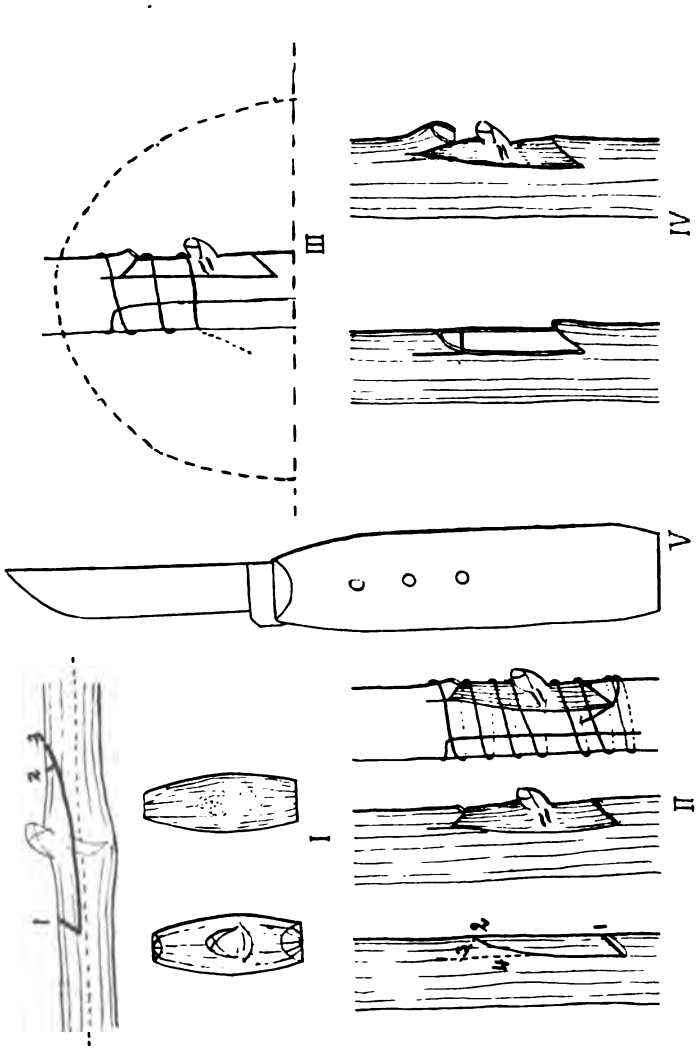

Fig. 125. I. How to remove a bud from the scion cane; II. How to cut the stock, insert the bud, and tie the graft; III. How the graft should be mounded up; IV. Mr. Rounce's modified Yema grafting; V. Knife used in Australia for Yema grafting.

For preparing the stock four cuts are necessary. The first one is made in a way similar to that used for the scion (figure I). The method of making cuts 2, 3, and 4 is shown in figure II. For the easy insertion of the scion bud into the cavity prepared for it on the stock, cut number 4 is continued for about a third of an inch. When the scion has been put into place, if the flap protrudes too much over the scion it may be cut downward, so that the cut of the scion closely coincides with that just made. A small gap is not dangerous, for callusing formation will fill it up in all cases. To insure perfect success with this method, the contact of the cambium layers of stock and scion should be as perfect as possible. Therefore scion and stock must be of about the same size, and care must be taken to have the external line of the scion within that of the cut made on the stock. If the contrary occurs there will be great danger of drying up of the bud and consequent failure of the graft. Tying is required to hold the scion firmly in place until healing is complete. To complete the operation, the graft must be mounded up so that the tissues which have been cut will not dry out and will find themselves in a good callusing medium (figure III). This is accomplished by the mound, for within it are found: (a) a moderate degree of moisture, (b) air, and (c) heat, the three factors necessary to callusing. The last factor is easily obtained at the time of the year this graft is usually made, and callus will, in a short time, unite scion and stock.

MR. ROUNCE'S MODIFICATION.

While the above described method requires tying and often untying of the grafts after healing of the tissues, in another method, figure IV, the tying is done away with. This is rendered possible by reducing the length of the scion bud. On the contrary, its thickness is increased and similarly the depth of the cut into the stock. With two cuts the scion bud is removed in a very similar way to that used in figure I (1 and 3). While making the second cut an oscillatory motion of the grafting knife prevents the splitting of the tissues and gives a plane surface to the section of the scion bud.

On the stock three cuts will give the cavity into which the scion bud is inserted. When well performed the graft obtained in this way needs no tying. There seems to be no difference as to the quality of the unions of the grafts resulting from the use of the two methods. However, this one is to be preferred to the first one described because it saves time, owing to the smaller number of cuts necessary and the omission of tying.

SCION CONDITIONS.

The canes chosen for scions must be properly ripe or show a brown color. Those having a green or yellowish tint do not furnish good buds. They should be rather smaller in diameter than the stocks to be grafted. Buds with laterals freshly cut should not be used, for they generally fail to heal. It is needless to say that great care must be taken to avoid the drying out of the scion canes. A satisfactory way is to place them in a wet cloth after removing the leaves, and to get a small supply at a time. If scions are not available in a nearby vineyard, great care must be taken against the drying out of the canes sent from a distance.

These should be immersed in clean water for twenty-four hours before using. Thoroughly mature canes from the previous year can also be used if they have been kept perfectly dormant. In this case they should be soaked in water for at least twenty-four hours before grafting.

STOCK CONDITIONS.

A condition of success is that the stock be well in sap in August or September. This will be insured by good preparation of the ground before planting and thorough cultivation during spring and summer. A too large stock is not to be desired. The most convenient size is about half an inch. Older stocks are best grafted by the usual methods.

THE GRAFTING KNIFE.

An ordinary budding knife can be used for making the Yema graft, but a nonfolding bladed knife, as seen in figure V is more convenient and is made and used in Australia. Its stout handle enables a man to hold it firmly.

CARE OF THE GRAFTS.

It is a good precaution to watch the formation of the callus, especially if the grafts have been tied. A too abundant formation of the tissue will necessitate the cutting of the tie. The mound must not be removed till the following spring, when the buds are examined. Those which are successful are solid and plump; those which have failed are shrunken and are easily removed from the stock. When the vines begin to sprout the stock of the successful grafts must be cut back, so as to force the bud of the scion, which has remained dormant until then. Opinions differ as to how severe the cutting back must be. A too close removal of the stock above the bud may result in the loss of a good many grafts by drying out. If too much of the stock above the graft is left, the scion bud may fail to sprout. It is good practice to leave about two or three inches of the stock above the bud. This stub will be removed at the next pruning season close to the grafts. The misses can be grafted by the ordinary method of field grafting in the spring.

When the top of the stock is removed, the vine must be staked. This is very important, for the growth of the scion bud is so rapid, owing to the perfection of the union, that the tender shoot easily breaks off. To prevent this accident the young shoots are tied to the stakes as soon as possible.

Great damage to the buds and the young shoots of the grafts can be done by cutworms. It will be important to watch them in the spring. As with the other methods of grafting, the emission of scion roots and water sprouts must be carefully looked after during the growing season.

TAKEN IN QUARANTINE BY WAY OF THE "BACK DOOR."

By HUGH KNIGHT,[1] Riverside, California.

The most spectacular work of the Quarantine Division of the State Department of Agriculture is done at the various ports of entry, the front door, as it were, into California from foreign countries. Here it is that the public comes into contact with the quarantine inspectors who

Fig. 126. In which a box shipped from Chicago, Illinois, to Riverside, California, marked "Oregon apples," upon investigation was found to contain "Florida grapefruit" infected with Melanose and infested with purple scale.

EDITOR'S NOTE: This article by Hugh Knight of Riverside furnishes a good illustration of attempts that are sometimes made to evade quarantine orders or regulations.

During the latter part of last February, Deputy Quarantine Officer C. H. Vary of Los Angeles discovered two suspicious looking boxes that were passing through Los Angeles on their way to Riverside. Quarantine Guardian D. D. Sharp of Riverside was notified regarding these boxes and upon their arrival found that the carefully wrapped apple boxes contained Florida grapefruit, which under Quarantine Order No. 28 can not legally enter the State of California. The illustration with this article shows how carefully the shipper of this fruit planned to conceal what was within.

[1]Department of Entomology, Citrus Experiment Station, Riverside, California.

look into the cargo on board of vessels and also the baggage belonging to passengers. (See cover illustration.) Detailed reports covering the operations are published which show the good work being done by that branch of the Quarantine Division. (See Quarantine Reports in each Monthly Bulletin.)

There is another branch of this division, however, guarding the rear entrance, that works quietly right here at home and that accomplishes equally important results in the protection of the horticultural and agricultural interests of the state, but which seldom comes before the public notice. It is not generally realized that the greater part of the Quarantine Division is composed of the county horticultural commissioners acting as state quarantine guardians and their entire corps of inspectors acting under them as Quarantine Inspectors. It is the duty of these men to inspect carefully all shipments of plants, fruits, etc., coming into California "overland" from other states, for there are just as dangerous pests existing in other parts of the United States, that are "not" found in California, as there are in foreign countries, and it is primarily due to the eternal vigilance and efficiency of this section of the Quarantine Division that these pests have not long ago ravaged our orchards and farms. Let me mention just two in passing. First the cotton boll weevil; this insect has cost the Texas cotton growers an annual toll of $27,000,000, or an aggregate loss of over $125,000,000 since its first invasion of that state. In some instances it destroys over fifty per cent of the crop. In spite of this fact, which is well known to cotton growers everywhere, there are men in our cotton section in Imperial and Riverside counties who deliberately and in direct violation of the law and in ways numerous and devious, endeavor to import Texas cotton seed into their section. Several such shipments have been detected, held up and destroyed in the last two seasons.

The second pest is the dreaded citrus canker of Florida. Efforts to eradicate this disease have cost over $1,500,000 to date and grove after grove has been burned as there is no known remedy for it. This disease can be carried either on the plant or fruit and for that reason a rigid quarantine has been established against all citrus fruit from Florida. This fact is well known to all citrus men in California and yet, unbelievable as it may seem, there are men, "citrus men," right in the heart of our citrus section in Riverside who, merely to gratify a personal whim, will endanger the great $50,000,000 citrus industry of California, by endeavoring by every means within their power to "smuggle" Florida grapefruit into this section in direct violation of the law and under severe penalty for infraction thereof.

On February 27, 1919, there arrived in Riverside by express two innocent looking boxes, well wrapped in double thicknesses of heavy brown paper folded over the ends and tacked into place with large flat-headed tacks. They were addressed to two prominent citizens of Riverside, "citrus fruit men," and were shipped ostensibly by a Chicago firm. The only distinguishing mark on the boxes was "Fruit" in blue pencil on the outside. Being an interstate shipment it was promptly opened by the Quarantine Inspector. On the removal of the paper a perfectly innocuous apple box was disclosed with a handsome label

setting forth that the contents were "Apples of Quality," grown in the Wenatchee Valley, Oregon. Horticultural inspectors develop in time a wholesome bump of curiosity and not being satisfied with "Oregon" apples coming from Chicago, the box was opened, when the "apples" proved to be grapefruit grown and packed in Florida and with the Florida wrappers still on the fruit. In addition to a purple scale infestation, the following fungus troubles were found on the fruit by Professor Fawcett of the Citrus Experiment Station and reported on by him as follows: "Some of the fruits were affected with Melanose which is due to fungus, *Phomopsis citri*. One of the fruits which I had first noted also appeared to be affected a few days after you left them, with stem-end rot, also due to this same fungus, *Phomopsis citri*. As far as I know, this fungus has never been found in California."

Of course these shipments were promptly confiscated and destroyed.

MISLEADING NOTICES ATTACHED TO NURSERY STOCK BY CHICAGO SHIPPERS.

By CHARLES H. VARY,[1] Los Angeles, California.

The fact is generally conceded that the majority of our serious insect pests, with which the California horticulturist has to contend, have had their origin and have been introduced into California on nursery stock from the warmer regions of the Temperate zone or from the tropics.

The same is true of stock from northern importers and growers, who raise their plants under glass with artificial heat, thereby producing conditions ideal for the increase and development of insect pests.

In view of these facts, California horticultural inspectors have learned to look with suspicion on all nursery stock or fruits originating in the warmer climates.

Infested glasshouse plants, if placed on the market in the eastern or northern states, probably could do little or no harm, as the winter climate is severe enough in most localities to kill or keep the pests in check should any escape from the original plants to other vegetation. Climatic conditions in California are different, however, and insects that would be harmless in other states might readily become established in our midst and cause inestimable damage to California's horticultural industry, if such infested stock were allowed admission.

The state of Illinois has evidently overlooked this fact and by her state law sanctions the shipping of glasshouse stock without an inspection certificate accompanying it. Several large shipments of ornamental glasshouse plants have recently arrived in Los Angeles and vicinity from a firm in Chicago, Illinois, which, upon inspection were found to be thoroughly infested with three different species of insect pests, any one of which would thrive in the open here in southern California.

Usually in large shipments of this kind, the nurseryman exhibits a certain amount of pride in seeing that his stock is reasonably clean before being shipped, but in this instance no apparent attempt at

[1]Deputy Quarantine Officer, Los Angeles, California.

cleaning had been made; however, great care had been taken to have attached to each case a printed slip entitled "Notice to Agents," with an extract from the Illinois state law which would lead one to believe that no harmful pests could possibly be disseminated on this class of stock. The notice reads as follows:

> This box contains greenhouse plants which do not come under the nursery inspection law and do not require a state entomologist's certificate. The following is an extract of the law which shows greenhouse stock as exempt:
> "The provisions of this section shall not apply to florists' greenhouse plants nor to flowers or cuttings commonly known as greenhouse stock, and no certificate shall be required for the shipment of native stock collected in the United States and not grown in nurseries."

While a notice like the above attached to a shipment of nursery stock may meet with the approval of the eastern states, it certainly has no place on a case of plants destined to California. It does not mention from what law the quotation was taken, thus making it confusing and misleading to California agents, who are instructed by the California state law to hold all nursery stock arriving at their stations and to notify the inspector of its arrival.

It is needless to say that the shipments of plants referred to above are being held in quarantine and thoroughly treated.

CONSERVATION IN THE USE OF MANURE.

By ROBERT W. HODGSON,[1] Los Angeles, California.

The handling of manure for use as fertilizer in citrus orchards is rapidly becoming an industry of considerable magnitude in southern California involving many hundreds of thousands of dollars annually. According to the last report, the Fruit Growers' Supply Company, a subsidiary organization of the California Fruit Growers' Exchange, the big citrus marketing agency, in the year 1918 handled well over one hundred thousand dollars worth of manure for its members, not to mention the two other large companies dealing in this material. Citrus growers everywhere are beginning to realize the absolute necessity of a supply of readily decayable organic matter for use as fertilizer in order to maintain their orchards in profitable bearing condition. Manure furnishes one of the three possible sources of such material. The supply of this substance in southern California at the present time does not equal the demand, and with the rapid displacement of the horse by the truck and the tractor, the future does not hold out prospects for any increase in the supply. In fact, the amount of manure produced in this part of the state has probably already reached its maximum and growers have good reason for becoming apprehensive as an imminent shortage looms up in the not distant future. There is therefore very good reason for the decided interest now manifest on the part of citrus growers as to ways and means for conserving manure and making the most beneficial use of it.

[1]Acting County Agent, Division of Agricultural Extension, University of California.

SOURCES OF LOSS.

Much of the valuable plant food constituents which manure should contain is of course lost in the stables before it is ever loaded upon cars for shipment. The greater part of this loss occurs in the urine which instead of being conserved either by the use of efficient bedding materials or being caught in cisterns and later pumped back into the solid part prior to its collection for shipment, is usually allowed to drain away either into the soil or else run into the sewer. A certain amount of this loss is probably unavoidable, but much could be done in the way of conservation by the use of more and better bedding material and by the installation of cisterns.

Another source of loss in the stable is by fermentation which results in the loss of nitrogen to the air as ammonia or free nitrogen. A part of this loss at least could be avoided by more frequent cleaning out of

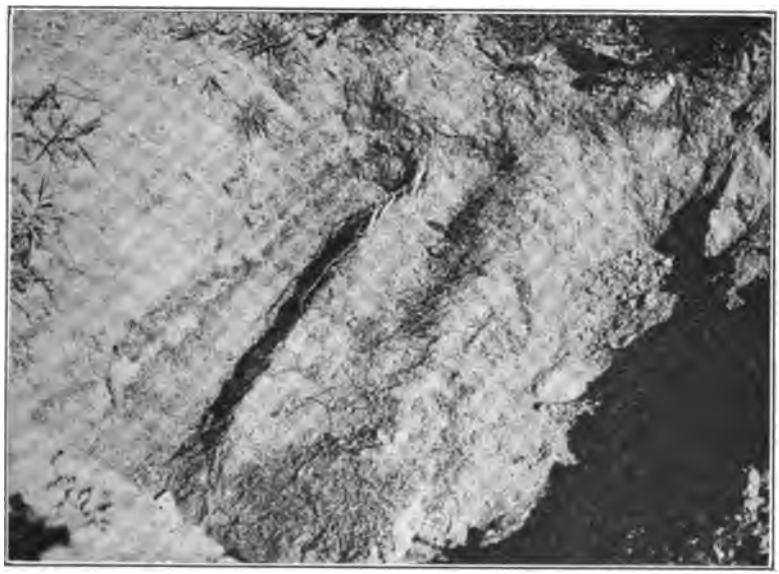

Fig. 127. Mass of feeding roots entirely filling up pit filled with manure several years previously. No roots have grown beyond the manure.

the stables, allowing the manure to dry out thoroughly, which effectively stops fermentation.

But the greatest loss, and that which could very largely be avoided, occurs after the manure has reached the place of use and is either being stored or applied. In case the orchardist does not intend to apply it to the orchard immediately, the common practice is to place it in piles along the edge of the orchard or in some other convenient place. Here it may lie some little time subject to considerable losses through leaching by winter rains and by fermentation. Or the orchardist may find it desirable to spread it on the orchard where it may lie through the winter months. In this case the losses from leaching are not so important unless considerable run-off of rain water results. But the losses from fermentation and aerobic decay are very large. Recent researches,

he has gotten splendid results from pit manuring. He digs a pit on either side of the tree and at about the distance from the tree that the farthest feeding roots are to be found, the pits running at right angles to the direction of the irrigation furrows. Between six and ten cubic feet of manure is used to the tree, which he finds is sufficient to last for about three years, when he makes another application. On digging down into one of these pits, after two or three years, one finds the entire pit a mass of feeding roots as shown in the illustration. Trees manured in this way have made a much more rapid growth than trees not manured and have borne much better crops.

THE "TRENCH" METHOD.

Manure has been applied in deep trenches dug by hand either around the tree at a distance of six or eight feet or along the tree row under the drip of the trees, but this system was long ago abandoned on account of the expense involved in making the trenches as well as the amount of roots cut in making the trenches.

THE "FURROW" METHOD.

The most satisfactory method for applying manure and capable of general application is the so-called furrow method, now on the lips of many citrus growers and being tried out extensively, largely as the result of the recommendations of Mr. Shamel.

In this system, the manure is applied in furrows of varying depth, which are cheaply and quickly made with the turning plow or other implement. In young trees such a furrow is run on either side and rather close to the trees. In older trees a furrow is run parallel to the tree row and on either side under the drip of the trees. In the case of

Fig. 130. Manure placed in a deep furrow four months previously; apparently disposes of the claim that it rapidly sinks down in the soil. This manure is still where it was placed, as was also that deposited in the furrows several years. The cross section of manure is shown outlined.

old bearing trees a single furrow is run down each middle in the center. In these furrows is placed about ten cubic feet of manure to the tree, which is covered up immediately by plowing in the furrow. In this way the manure is covered and losses prevented.

Mr. Shamel advocates a shallow furrow, six to eight inches in depth, basing his recommendation largely upon the cheapness with which such a furrow can be made as well as the fact he claims to have uncovered that the manure rapidly sinks down into the soil. Certain other citrus men do not agree with him on this point, but prefer a furrow fifteen or eighteen inches deep with more manure in it. Such a furrow can be made cheaply with modern tools. Those advocating the deeper furrow reason that the feeding roots will go where the plant food is and that it is desirable to encourage them to go deeply. Then too the deeper furrow with more manure lasts longer than the shallow furrow and thus offsets what additional cost the deep furrow might involve. The merits of these two systems, however, are yet to be decided.

The important thing is that citrus growers are rapidly coming to the use of a system of handling manure that provides for covering it up immediately and preventing loss and thus making the most beneficial use of it.

PEAR GROWING IN THE FOOTHILLS REGION.

The Sierra Nevada mountain and foothills region is admirably adapted to pear growing. Arrangement of orchard heaters to prevent frost damage.

GRASSHOPPERS AND CONTROL MEASURES.

By T. D. URBAHNS,[1] Berkeley, California.

Most of the valleys west of the Sierras have at one time or another experienced severe outbreaks of grasshoppers. Early settlers suffered many severe losses. In more recent years great development has taken place in many sections. New lands have been brought under irrigation and more intensive agriculture has been developed. But vast areas of high and dry lands remain uncultivated and here the breeding grounds of grasshoppers remain undisturbed. In addition to these breeding grounds, some species have become adapted to the alfalfa fields and found the conditions most favorable both with regard to food and breeding places. Consequently the source of a destructive grasshopper outbreak is not necessarily from the hills and dry lands as is generally supposed. In fact, some thickly settled communities are suffering severe annual losses to fields and orchards by great swarms of this pest which breed but a few minutes' walk from the dooryard. Other species breed almost exclusively on grass lands, where they usually remain until their food plants dry up. After this they migrate to greener fields, causing destruction to all succulent vegetation in their path.

Fig. 131. Grasshopper damage in California in 1919. A. All that was left of a citrus fruit. B. Defoliated citrus branch. C. Damage to orange; soon the entire skin would have been destroyed.

WILL GRASSHOPPERS CONTINUE TO BE A PEST?

With the vast breeding grounds of grasshoppers to a great extent unchanged over the area west of the Sierra Nevada Mountains, and new breeding grounds found by some species in the alfalfa fields, we may expect the appearance of this pest whenever climatic and certain other conditions are favorable for their development.

The annual destruction is inestimable. Large areas of alfalfa are destroyed in June and July. Orchards are defoliated and small trees killed. Gardens and ornamental plants are frequently destroyed.

[1]Entomological Assistant, Bureau of Entomology, U. S. Dept. Agr., Washington, D. C.

OUR MOST DESTRUCTIVE SPECIES.

The differential grasshopper (*Melanoplus differentialis* Thomas) (Fig. 132) is a yellow and brownish colored grasshopper about 1½ inches in length when fully developed. It is one of the most destructive species in the San Joaquin Valley, where it breeds in large numbers in alfalfa fields. Its favorite food seems to be alfalfa, but it frequently attacks orchards and gardens.

Fig. 132. The differential grasshopper (*Melanoplus differentialis*): One of the most destructive species. (U. S. Dept. Agr.)

Fig. 133. The lesser migratory grasshopper (*Melanoplus atlanis*): Destructive in the Imperial and Sacramento valleys. (U. S. Dept. Agr.)

The lesser migratory grasshopper (*Melanoplus atlanis* Riley) (Fig. 133) is a light yellowish species about 1 inch in length. It is destructive in the Imperial and Sacramento valleys. It breeds freely on alfalfa and grass lands and feeds on alfalfa, melons, beans, and many other plants.

Fig. 134. The yellow-winged grasshopper (*Camnula pellucida*): Destructive in orchard, garden and range. (U. S. Dept. Agr.)

The yellow-winged grasshopper (*Camnula pellucida* Scudder) (Fig. 134) when adult is about 1 inch in length. Some are light yellow, others ashy brown. It breeds mostly on grasslands and is destructive to native meadows, corn, oats, beans, young orchards and gardens. Very active in flight and frequently appears in large swarms.

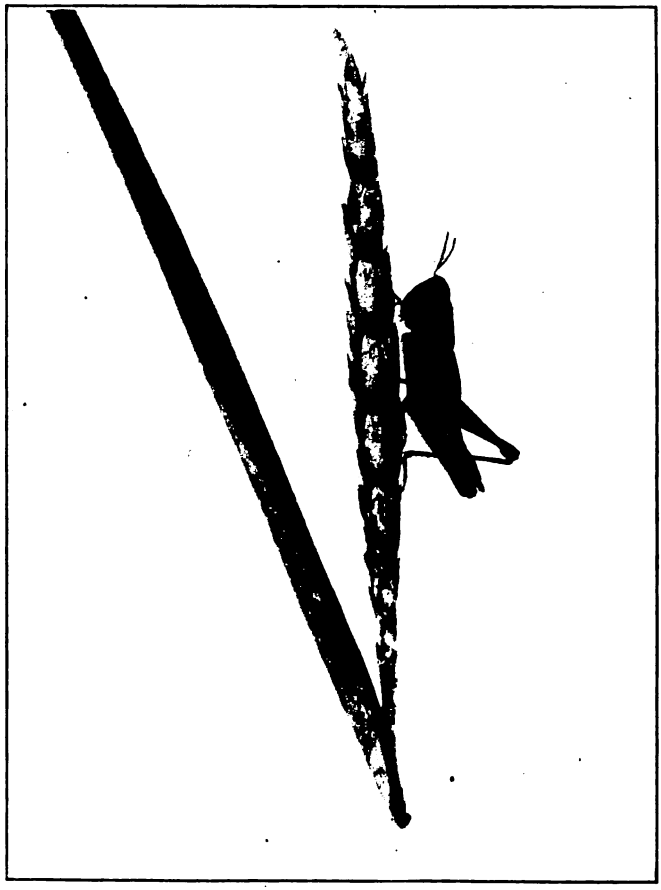

Fig. 135. *Melanoplus marginatus*: One of the smallest destructive species. (U. S. Dept. Agr.)

Melanoplus marginatus (Fig. 135) is one of our smallest destructive species. It measures slightly less than an inch in length, is dark brown in color and almost wingless. It breeds in the valley alfalfa fields, foothills and grasslands, and is destructive to alfalfa, orchards and gardens.

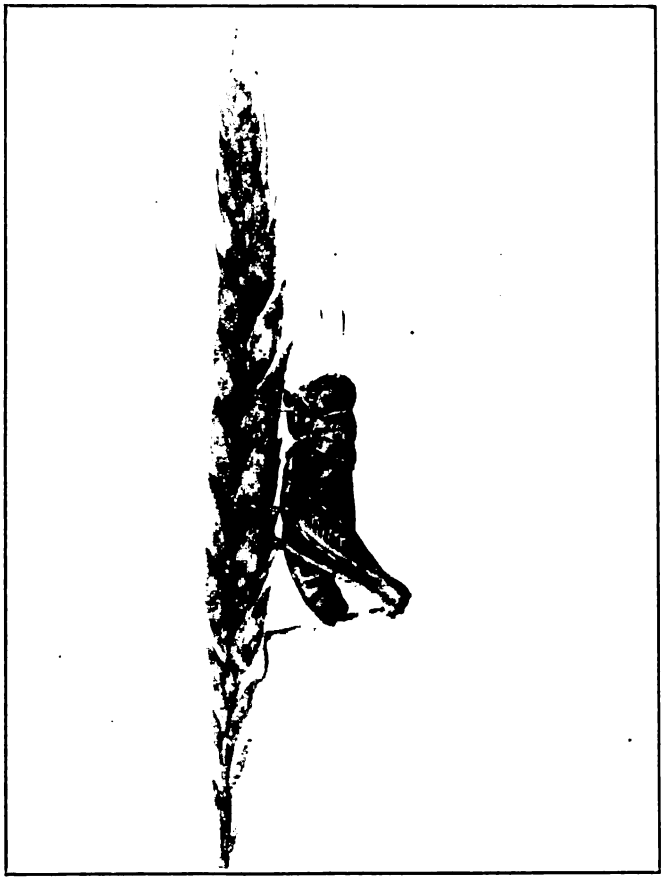

Fig. 136. *Oedaleus enigma*: A small grasshopper, destructive to alfalfa and young orchards. (U. S. Dept. Agr.)

Oedaleus enigma (Fig. 136). A yellow species about 1 inch in length. It has short wings and is awkward in flight. Breeds in large numbers on dry grasslands and is destructive to alfalfa and young orchards.

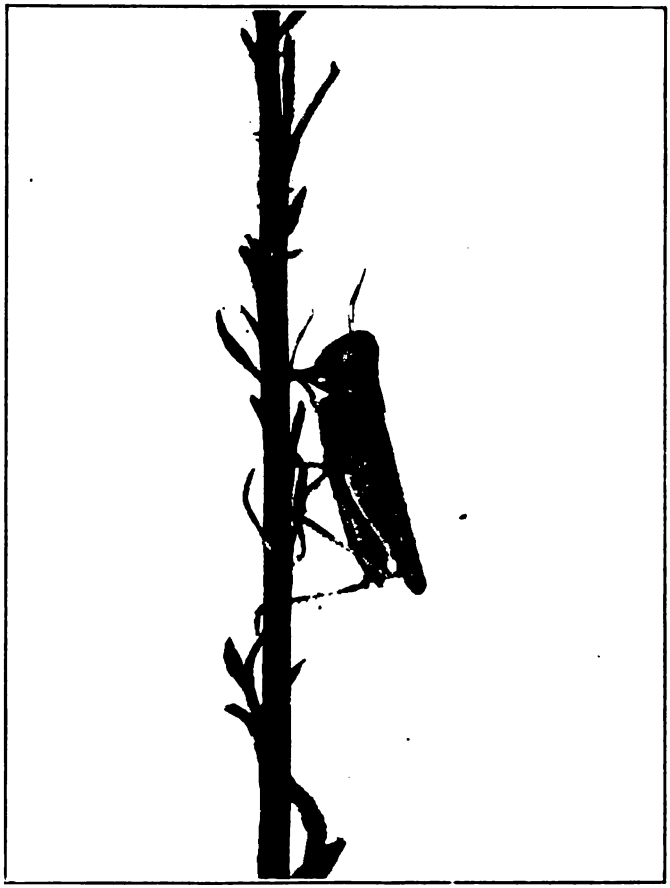

Fig. 137. The devastating grasshopper (*Melanoplus devastator*): A small grasshopper that damages orchards, vineyards, gardens, alfalfa and bean fields. (U. S. Dept. Agr.)

The devastating grasshopper (*Melanoplus devastator* Scudder) (Fig. 137) is yellowish brown, about 1 inch long and in appearance very much like *M. atlanis*. It breeds mostly on dry lands, also in alfalfa fields. It is active in flight and destructive to alfalfa, vineyards, orchards, gardens and bean fields.

Fig. 138. *Schistocerca venusta*: One of the larger grasshoppers that breeds in the alfalfa fields of the Imperial and San Joaquin valleys. (U. S. Dept. Agr.)

Schistocerca venusta (Fig. 138) is a greenish colored grasshopper measuring from 2 to 3 inches in length. It breeds in alfalfa fields of the Imperial and San Joaquin valleys and is frequently seen flying in swarms in corn fields.

CAN GRASSHOPPERS BE CONTROLLED?

In most instances the recurrence of the enormous losses caused by grasshoppers can be prevented. This may necessitate a great deal of effort on the part of individuals and communities. In fact, in most instances the grasshopper problem is a community problem and should be taken up as such. Organization, experience and action are necessary. The conditions peculiar to each infested locality should be considered independently. In like manner every farmer should acquaint himself with the habits and breeding places of those species attacking

his own fields and orchards. A thorough knowledge of the breeding places, habits, and control methods are the first essentials in checking the ravages of this pest.

DESTROYING GRASSHOPPERS IN THE HILLS.

The species selecting grass-covered slopes in the hills as their favored breeding grounds, hatch in early spring, feed upon the green grasses for a time and then with the dying of the grasses begin to migrate. The course of travel is frequently down gulches, where they at first accumulate in great hordes. In such places they may be most effectively poisoned, and should under no condition be allowed to reach the valuable crops and orchards in the cultivated areas. Grasshoppers can sometimes be driven into definite areas and concentrated for more effective control by herding a large drove of sheep slowly around the infested area.

PROTECTION FROM RANGE INFESTATIONS.

A farming community suffering from grasshoppers working their way in from range lands should take up the fight as a community problem. An effective barrier can frequently be made by burning over a strip of grassland one-fourth mile wide along the edge of the cultivated area.

Waste areas and fence lines are frequently burned to destroy grasshoppers. Before this method is employed every precaution should be taken that the pest will not be driven ahead of the flames and into the fields or orchards. Most species will not attempt to escape from the flames if the burning is done at night.

GRASSHOPPERS IN ORCHARDS.

Any one developing young orchards should make every effort to keep the grasshoppers out of the trees. They can be much more effectively controlled in the green alfalfa or grass lands than is possible after they once enter the trees. Clean cultivation of orchards, fence lines and roadsides will prevent this pest from breeding on cultivated areas. If grasshoppers have already entered the trees, poison bran should be spread broadcast between the rows (not at the base of the trees); and it is necessary to keep brushing the grasshoppers out of the trees and moving so that they will hop to the ground and pick up the poison.

THE HOPPERDOZER.

Several types of grasshopper catchers have been in use for many years and immense quantities of grasshoppers have been caught with them. The writer, however, considers the poisoned bran mixtures the most practical for general use.

POISON.

The grasshoppers breeding on irrigated lands make their first appearance in May and the first days of June along the higher ridges, such as ditch banks, fence lines, check ridges and small waste areas. Poisoning this pest in its early stages should begin as soon as they have hatched in large numbers and before they spread over the entire fields. If the infestation over alfalfa is hardly severe enough to warrant spreading

the poison over the entire field, the alfalfa of alternating lands may be cut, thereby crowding the grasshoppers on to the uncut portions or strips, where they may be effectively poisoned, and with reduced expenditure of labor and money.

MIXING THE POISON.

The following formula has been found very effective in destroying grasshoppers:

Paris green (or white arsenic)	1 pound
Molasses (cheap black strap)	2 quarts
Lemons	½ dozen
Water	4 gallons
Wheat bran (or alfalfa meal)	25 pounds

Mix the above materials as follows: Stir thoroughly the Paris green, molasses and water first. Grind the lemons in a meat grinder and add to this liquid. Then slowly pour the mixed solution over the bran and stir thoroughly until an even mixture is secured. If alfalfa meal is used in place of wheat bran it will be necessary to add an extra gallon of water to the mixture.

SUBSTITUTES.

If the Paris green can not be secured, white arsenic may be used instead, and reasonably good results expected. Oranges may be used to replace the lemons if the latter can not conveniently be secured. If wheat bran is found too expensive, good results may be expected by substituting alfalfa meal.

METHOD OF SPREADING POISON.

Where the poison is to be spread on rocky hillsides, ditch banks and fence lines, it is most convenient to have the poison bran mixture in a bucket and spread it by hand, as in the manner of broadcasting grain. If fifty or one hundred, or even one thousand acres are to be covered with this poison, it has been found most practical to spread it with an end-gate grain-seeder attached to the rear of a farm wagon and geared from one of the rear wheels. The poison bran bait should be spread so that it falls on the ground as fine as possible, avoiding any lumps, which are a waste of material. The above proportion should be sufficient to cover an area of about five acres. The poison mixture should be spread soon after it is prepared and before it becomes sour.

WHEN TO SPREAD POISON.

Grasshoppers are naturally most hungry and thirsty after they have been driven to the shade by the intense heat of a summer day, and may be noticed to begin feeding ravenously late in the afternoon. For this reason it is desirable that the poison should be spread in the afternoon, and still early enough so that it is on the ground before the hoppers have secured their evening feed. It is better to spread the poison over fields a few days before irrigation than just following irrigation, and before cutting alfalfa than after the field is bare.

RESULTS TO BE EXPECTED.

Two or three days after the poison bait has been properly spread over the field the grasshoppers should begin to collect in the crowns of plants

and other shaded places and die in great numbers. The dead grasshoppers are frequently destroyed by beetles, ants, grasshoppers and other insects, some of which are active only during the night.

DANGER OF POISONING LIVE STOCK.

If the poison has been properly spread over fields there should be absolutely no danger of poisoning live stock. This poison bait has been used in great quantities by the writer, on alfalfa fields which were being pastured by young and old live stock, with no indication of injury to any of the animals; and even around farmyards, with very little loss to poultry. It must, however, be remembered that this poison should not be mixed near the house or barnyard where poultry and live stock are present and may chance to eat quantities of the poisoned bait.

YOUNG APPLE TREE WITH STRONG FRAMEWORK DUE TO CUTTING BACK.

INFLUENCE OF HEAVY AND LIGHT PRUNING UPON THE GROWTH OF DECIDUOUS FRUIT TREES.

By WARREN P. TUFTS,[1] Berkeley, California.

In the production end of the fruit business the orchardist is above all things interested in *growth*. Growth, whether it be fruit growth or wood growth, is essentially the same, and therefore the two are dependent upon the same conditions. Kraus and Kraybill,[2] in a recent contribution, have shown that the vegetative and reproductive functions of a plant are largely influenced by the ratio existing between the available carbohydrates and nitrates rather than by the total supply of either of these essential plant food materials. In this brief paper no attempt will be made to consider the effects of such factors as altitude, climate and soil upon growth, but the discussion will be limited to the influence exerted by light and heavy pruning upon the resultant behavior of the nonbearing deciduous fruit tree.

"If you would have your trees stocky, strong, and mechanically able to support heavy crops, prune your orchard severely for at least four years after planting," has been the advice commonly heard in nearly all deciduous fruit growing sections of California. So strong has this tradition become among California growers that the writer feels as though he were treading on hallowed ground to even dare suggest the possibility that certain modifications of the present well-nigh universal practice might be profitably investigated. Considered from the standpoint of plant physiology, it would seem that annually to remove a large portion of the leaf-bearing area, which is the factory of food production for the tree, would of itself tend to weaken the life processes of the plant. The fact, however, that orchard trees have in almost all cases responded to the heavy annual cutting with an exuberant vegetative growth the following season has misled many to believe that annual shoot growth alone is the true index of the plant's vigor. Is it not, however, more accurate to measure the tree's activity by the total weight of wood laid down over the whole plant? In order to arrive at the correct conclusion in a feeding experiment, say with pigs, the whole animal is measured and weighed from time to time, and not merely a certain portion. So also in the case of plants, a true measure of vigor should be one which will be indicative of the response of the whole to certain treatments, rather than the response of certain organs.

Investigators working with various horticultural plants have, from time to time, used circumference of trunk, length of new shoot growth, height and spread of branches, size and weight of leaves, as proper indices of plant vigor. Probably the weight of the entire plant top and root is the most accurate index of the growth, taking into consideration as it does, not only elongations but likewise increments to the older portions of both top and root. Obviously it is impossible to take up a tree at stated intervals, wash the soil from its roots, weigh, and then expect that plant, when replaced, to continue its development undisturbed. It would seem from the measurements herein recorded

[1] Assistant Professor of Pomology, University of California.

[2] Kraus and Kraybill: Vegetation and Reproduction with Special Reference to the Tomato, Ore. Agr. Sta. Bul. 149, pp. 1-90, 1918.

that a definite correlation exists between trunk circumference and the weight of both root and top. Such being the case, a simple measurement of the circumference of the trunk of the tree is a fair indication of its total development.

With the weighing and measuring of trunk circumferences just above the crown of the tree of 241 two-year-old black walnut (*Juglans californica* var. *hindsii*) seedlings, 245 almond (*Prunus communis*) seedlings, and 215 peach (*Prunus persica*) seedlings, the author has been able to calculate the correlation existing between trunk circumference and root and top weights. These seedlings received ordinary commercial nursery treatment, but instead of being budded during the latter part of the first summer and then severely cut back during the dormant season, they were allowed to make two seasons' undisturbed growth in the nursery row. At the end of two years, the entire planting was removed. The walnuts were pulled with a tractor soon after a heavy rain, with the result that practically the whole root system was obtained (Fig. 139). Walnut trees with broken tops or roots were not included in these measurements.

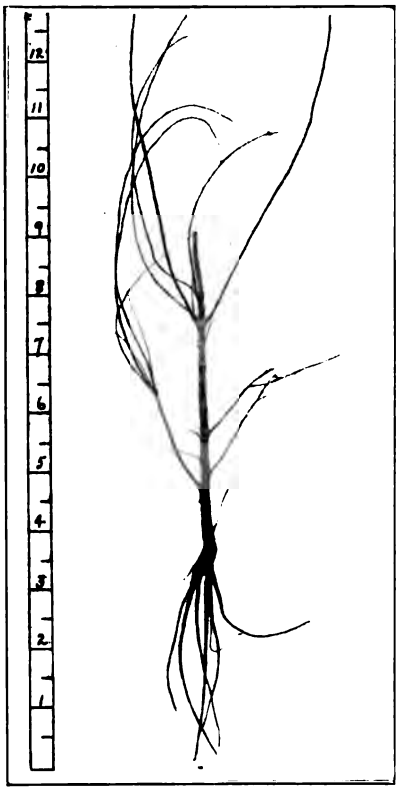

Fig. 139. Showing two-year-old black walnut seedling top and root. The roots are four feet in length. Only a portion of the top is shown.

It was found impracticable to pull the fibrous rooted trees with a tractor; consequently, as complete a root system of the peach and almond was not obtained as with the walnut. It is thought, nevertheless, that inasmuch as the root systems removed with these trees were as uniform as possible with hand digging (Fig. 140), the measurements and weights are decidedly worth while.

Table I, showing the calculation of the coefficient of correlation[1] between the circumference of trunk and weight of the top of young walnut trees, gives the method used in obtaining the results listed below.

[1]Any correlation coefficient falling between 0 and + 1 indicates that when one of the two factors or characters observed varies, the other varies also, and the nearer such coefficient approaches + 1, the more constant is the ratio of variation between the two factors. If the variation in the one factor is always exactly proportional to the variation in the other, we say there is perfect correlation between them, which is represented by the correlation coefficient + 1; while if one character varies without any relation to variations in the other, the correlation coefficient is 0, or there is no correlation.

Year-Old Bla

nce G=12.

Weight G=2.

Table II. Summary of Correlation Coefficients Calculated for Two-Year-Old Seedling Trees.

TAP ROOTED PLANT:		
Walnut—		
Correlation	between weight of root and top	.86 ± .010
	between circumference of trunk and weight of top	.83 ± .013
	between circumference of trunk and weight of root	.83 ± .013
FIBROUS ROOTED PLANTS:		
Almond—		
Correlation	between weight of root and top	.46 ± .034
	between circumference of trunk and weight of top	.91 ± .0074
	between circumference of trunk and weight of root	.76 ± .018
Peach—		
Correlation	between weight of root and top	.89 ± .0095
	between circumference of trunk and weight of top	.92 ± .007
	between circumference of trunk and weight of root	.84 ± .013

The coefficients just given are high, and are indicative of a very close degree of correlation existing between the circumference and weight of the tree, both top and root. With this fact established, it would seem that reliance may be placed on the results obtained from any orchard treatment influencing the growth of nonbearing trees when such results are based on trunk circumference measurements.

Attention is here directed to the fact that shoot length, circumference, and total weight measurements show only quantitative changes in the plant and disregard entirely the question of qualitative changes. Fruit growers are apt to lose sight of the importance of the *function* of various tree parts in their endeavor to secure the desired *form*. During the first two or three years the young tree is in the orchard, its whole energy is devoted to the formation of wood. When bearing age is reached, only a portion of the activities of the plant are engaged in wood production. For this reason, circumference measurements lose much of their value as soon as the trees cease their purely vegetative growth and prepare for the production of blossoms and fruit.

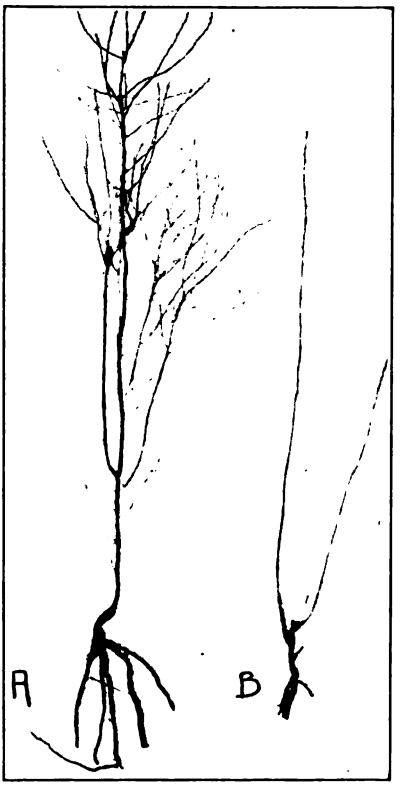

Fig. 140. A. Two-year-old almond seedling; root about eighteen inches long. B. Two-year-old almond seedling cut back heavily at one year. Note decreased top and root growth caused by repressive pruning. Tree shown at A received same treatment as B except for pruning.

Figure 140 shows the marked influence of severe heading upon subsequent top and root development. It will be noted that a heavy root system accompanies a luxuriant

growth of top. This observation is mathematically expressed by the following figures:

Table III. Influence of Severe Pruning Upon Subsequent Correlation of Root and Top Growth.

Almond—Cut back heavily at one year:	
Correlation between weight of root and top	$.73 \pm .024$
Peach—Cut back heavily at one year:	
Correlation between weight of root and top	$.68 \pm .043$

The trees upon which these measurements were made grew side by side in the nursery row with those from which the correlation coefficients given in Table II were calculated. The two lots of trees, therefore, received the same culture, with the single exception that one lot was cut back at the end of the first growing season.

These last figures are extremely interesting in that they completely explode the old tradition that heavy cutting of the top, although perhaps reducing the vigor of the above-ground parts, nevertheless results in renewed and strengthened root development. This old theory can not be supported from the standpoint of plant physiology. It is here shown with mathematical exactness that a pruning practice which reduces the vigor of the top in like degree reduces the vigor of the root.

S. U. Pickering[1] of Woburn, England, has for many years conducted pruning experiments with apples. The results of these investigations show that the less a tree is pruned the larger and heavier it becomes. At the end of twelve years, trees which had been heavily pruned, lightly pruned, and others which had received no pruning, were dug up and examined. It was found that those trees which had been heavily pruned during the experiment were 16 per cent lighter than those which had received only a light pruning, and the trees which had not been pruned were 20 per cent heavier than the lightly pruned ones. Alderman and Auchter,[2] in experiments carried on for four years in West Virginia, found that trees had an average increased trunk diameter, when heavily pruned, of 1.61 inches; when moderately pruned, of 1.69 inches; and when lightly pruned, of 1.93 inches. Likewise Gardner[3] at Oregon found that on the average the unpruned tree increases in size a little more rapidly than the tree that is winter-pruned only, or that is both winter- and summer-pruned. These statistics are of themselves quite convincing, and clearly show that the so-called invigorating influence of pruning is not sufficient to give the branches of the pruned tree the same girth as those of the unpruned tree, nor will the total weight of the pruned plant equal that of the unpruned.

The writer's attention had been repeatedly drawn to the results of the experiments above mentioned, and yet he felt that the tradition for heavy pruning which holds so firmly in California must surely have some foundation. Consequently, careful measurements were made of trunks and branches of trees receiving widely differing pruning treatments.

[1]Bedford and Pickering: Pruning. Woburn Experimental Fruit Farm, Seventh Report, 1907.

[2]Alderman and Auchter: The Apple as Affected by Varying Degrees of Dormant and Seasonal Pruning. W. Va. Univ. Agr. Exp. Sta. Bul. 158, 1916.

[3]Gardner, V. R.: Pruning Investigations. The Early Summer Pruning of Young Apple Trees. Ore. Agr. Col. Exp. Sta. Bul. 139, 1916.

These measurements have not been kept for apple trees, as in the case of the English, West Virginia and Oregon experiments, but include practically all other deciduous fruits grown commercially in California. These experiments include measurements on apricots, cherries, peaches, pears, plums (Japanese and European) and prunes. The experimental trees are planted on deep, rich Sacramento Valley loam soil, characteristic of Yolo County, have not been irrigated, and, with the exception of the pruning, have received identical cultural treatment. The following table briefly summarizes the results of the different pruning treatments after one season's growth.

Table IV. Average Increase in Circumference in Centimeters.

Kind of fruit	Pruned severely	Pruned moderately	Pruned lightly
Apricot	11.7 centimeters	12.6 centimeters	15.3 centimeters
Cherry	10.0 centimeters	11.2 centimeters	12.3 centimeters
Peach	12.0 centimeters	16.9 centimeters	19.4 centimeters
Pear	8.7 centimeters	9.1 centimeters	9.7 centimeters
Plum (Japanese)	6.3 centimeters	10.4 centimeters	11.3 centimeters
Plum (European)	7.2 centimeters	8.8 centimeters	9.4 centimeters
Prune	6.2 centimeters	7.1 centimeters	8.4 centimeters
Average	8.9 centimeters	10.9 centimeters	12.3 centimeters

Experiments were also made with almonds under somewhat different conditions, but with very similar results.

In order to secure data on the stockiness of branches as influenced by different pruning treatments, measurements were made on apricot trees which had been only lightly pruned, others which had been moderately, and still others which had been severely pruned. All measurements were made at a height of three feet from the ground, the trees having been evenly headed at time of planting. The results of these measurements are exactly in accord with those made on the trunk, namely: those trees which received a light pruning had an average branch diameter at three feet from the ground of 5.09 centimeters, those moderately pruned 4.66 centimeters, and those heavily pruned 3.85 centimeters. Certain German investigators[1] have reported an average thickness of limbs of apple trees heavily pruned as being 8.4 centimeters; of those only lightly pruned 9.5 centimeters; and of those unpruned the average thickness of the limbs was 11.7 centimeters.

Summer pruning nonbearing trees, whether performed early or late in the season, exerts a marked influence on vigor as measured by trunk increments. During the summer of 1916 the writer subjected four blocks of flourishing two-year-old trees consisting of apricots, cherries, peaches, pears, plums (Japanese and European) and prunes to various treatments. Block A received no summer pruning, and the average increase of the trunks was 7.5 centimeters (152 trees). Block B received a moderate thinning out and heading back on May 4, and the average increase of the trunks was 6.5 centimeters (252 trees). Block C received a moderate thinning out and heading back on May 4 and again

[1]Goethe, R. Die Einwirkung des alljahrlich ausgefuhrten Schnittes auf das Wachstum der Baume. In Bericht der Kgl. Lehraustalt fur Obst.- Wein- und Gartenbau zu Geisenheim am Rhein.—1899-1900.

on July 11, and the average increase of the trunks was 5.2 centimeters (96 trees). Block D received a moderate thinning out and heading back on August 8, and the average increase of the trunks was 5.4 centimeters (30 trees; only apricots, cherries and pears in this block).

From the figures just presented it would seem that summer pruning at any time is devitalizing, and that midsummer cutting is more weakening than that done during the early part of the season. It is to be further noted that two comparatively early summer prunings were only a little more weakening than one given late in the growing period.

The figures herewith presented are only a few of those collected by the writer during the past four years, but it should be stated that all of these statistics show the some general tendency.

It is not the author's intention to give the impression that little or no pruning is desirable, but rather that the orchardist should bear in mind the *principles* herewith presented and shape his pruning *practices* with the end in view of obtaining the advantages to be derived from a knowledge of the facts. No attempt will be made at this time to discuss the laws of plant physiology underlying the results obtained by varying the severity of the annual dormant pruning.[1] It will perhaps be advisable, before bringing this article to a close, to mention a few practical applications.

If one branch or portion of a tree gains the ascendency, the grower is often at a loss as to how to handle the situation. That branch which it is desired to repress should be cut heavily, and that portion which it is desired to stimulate should be cut lightly.

On account of the heavy loads of fruit the tree is expected to bear, especially under California conditions, the mechanical strength of the plant itself is of the utmost importance. One of the main contributing factors to the breaking down of trees is the presence of weak, sharp-angled crotches. One very efficient method of preventing these crotches from occurring has just been mentioned—namely, *uneven* cutting. If two limbs arise from the same branch and are cut back equally, they will tend to produce an equal growth the following season. On the other hand, if one of these branches is subordinated, its development will be less, with the result that the lightly pruned branch will continue the framework and the minor branch will become a secondary fruiting limb with a strong crotch.

Those growers who have had difficulty in securing a proper spread in young cherry or pear trees will welcome any system which will make their task easier. Uneven cutting is one of the best ways to obtain this end. All branches having an outward tendency and which, at the same time, are suitable for continuing the framework of the tree should be encouraged, and upright limbs growing toward the center suppressed. This proceeding will have a decided tendency to give the desired spread.

Excessive vegetative or wood growth and fruit production do not go hand in hand, although they are dependent upon the same growth factors. A heavy dormant pruning disturbs the equilibrium existing between root and top, and the following season the tree makes an attempt to restore this balance, with the result that maximum fruit bud

[1]See Calif. Agr. Exp. Sta. Bul., Pruning Young Fruit Trees (Nov., 1919), for a discussion of principles of plant physiology involved, together with directions for the pruning of young deciduous fruit trees.

production is prevented. It would seem, therefore, that when heavy pruning is practiced the energies of the tree are devoted to the replacement of the lost foliage area, with the result that lighter pruning of young trees than is commonly practiced in California is to be strongly recommended. Two very practical reasons for the adopting of such a system are: first, by light pruning large and strong trees are most quickly secured, and second, such a pruning method is one which is conducive to precocious and prolific fruit production.

As a case in point, we may mention certain results obtained in our pruning experiments at the University Farm. The same Climax plum trees which were lightly pruned and were therefore very materially larger than the standard heavily pruned trees, bore, during the third season in the orchard, approximately a crate, and during the fourth season, two crates of fruit to the tree. At the same time, the heavily pruned trees produced no fruit the third, and less than half a crate the fourth season. Likewise, lightly pruned apricot trees produced twenty pounds of fruit the third, and sixty pounds the fourth season, and prunes ten to twenty pounds of green fruit the fourth season. Pears, under favorable growth conditions, should, with the lighter pruning advocated, yield a packed box of fruit the fifth year.

THE CALIFORNIA PRUNE, ITS PRODUCTION AND MARKET REQUIREMENTS.

By F. M. COLEMAN,[1] San Jose, California.

The humble prune is coming into its own. Its humble place in the past was largely due to its mistreatment.

It was shabbily treated first in its production. The grower counted it only a thing to be gotten rid of for a price. His education neglected all perception of relation between quality and price. All premium was on size, then why should quality matter? And secondly, in the markets it was treated as the professional horse trader doctors his property to conceal faults that it might sell for what it was not. The buyer expected to be in some way cheated when he bought a prune. It had no right to expect a rating better than second class. The boarding house that could afford no better sauce served prunes. It was the butt of ridicule, the synonym for third-rate mediocrity.

Growers' co-operative organizations promise the prune's redemption: first, by emphasizing quality value, by producing a prune worth something; and secondly, by an efficient sales system to secure its worth to the producer. So long as the lone grower thought of his crop as only one ten-thousandth of the whole production, his imagination could see no possible impression the quality of his fraction could make upon the whole. But when the united voice of all, acting through organization, declared for better quality, its realization came into actual prospect. Only by united action and centralized authority could the prune be changed from a tramp to an aristocrat. When it was made clear that quality will pay, and only quality can pass, then quality became a con-

[1]Editor "Sunsweet Standard," San Jose, California.

trolling factor. Today there is a rapidly growing sentiment for improvement, beginning with the tree. The highest authorities proclaim the possibility and value of a thoroughbred prune as equal to the like with domestic animals. Why give place and care to an inferior tree, when one producing more prunes of double the size worth three times as much takes no more space and care?

But such reformation necessarily comes slowly, as a tree does not mature in a year; and it takes nerve to sacrifice a healthy tree and wait years for a better. But the demand will become more insistent that all nursery stock must have a pedigree that guarantees the best.

Also improved methods of caring for and preparing the ripened prune can better its quality to a surprising degree. The contrast between the poorest and the best prunes equals that of like grades in bread or shoes or cattle, and the prune grower has enough pride and ambition to prefer to produce prunes of quality with a reliable promise that quality will pay. Sanitary curing and grading for quality as well as size will double its popularity.

The effective incentive to all production improvement is supplied by the efficient sales organization which secures a stable and adequate profit for capital and effort employed. By judicious advertising the consuming public is informed of the real food value of the prune, and its improved quality. An advertising cost of six figures could be borne only by the united production. By the old system of collecting the small fractions from the many growers and distributing to the trade and consumers, the agents were financially unfriendly to both great classes, to the extent that the size of their gains depended on their success in reducing price to grower and increasing cost to consumer. This is all changed by the united growers' selling agency. The aim is for growers' control to continue as far as possible through the process of distribution, that all unnecessary costs may be eliminated. The best quality and the lowest possible cost to the consumer stimulates consumption and is the best provision to take care of increasing production. The eater's favor holds as much promise of profit to our prune industry as does all possible improvement in production methods. And these two influences stimulate each other. The better the prune the more it is wanted; and the greater the demand for good prunes, the greater the effort to supply what is wanted.

The prune to win a place where the growers' prosperity requires it to go must compete successfully against a thousand other articles of food wanting the same place. Every time it is selected hundreds of other applicants must be rejected. To push it to this place of preference needs a sales organization and system with ability and energy equal to the best that are pushing its competitors.

DEEP SUBSOILING OF ORCHARDS IN THE LINDSAY DISTRICT, TULARE COUNTY.

By FRANK R. BRANN,[1] Lindsay, California.

INTRODUCTORY.

It is universally conceded that one of the most important essentials with regard to orchard soils is a desirable subsoil condition with regard to drainage, rooting area and quality of soil with relation to degree of available plant food, acidity, etc. Where necessary, to a certain degree, all of these conditions may be artificially improved upon—on soils comparatively free from hard rocks or boulders—by the adoption of deep subsoiling.

During the past fourteen years of almost constant association with orchard conditions in Tulare County (especially citrus orchards) the writer has realized the necessity of improving the subsoil conditions, especially of certain orchards, and in consequence has advised deep subsoiling where he believed conditions warranted this treatment.

Fig. 141. Type of Holt tractors (45 and 75 horsepower) utilized in subsoiling operations.

The majority of orchard owners agreed that a great deal of benefit would be derived from this treatment, but generally appeared quite skeptical regarding costs, feasibility of subsoiling to a depth of four feet where hardpan exists, and some have feared the breaking of roots in the older groves would cause too much shock to the trees.

However, since the operations of subsoilers in the groves of this section during the fall months of 1918, the question of deep subsoiling in orchards regarding costs, benefits, etc., have been wholly answered by the work performed thus far, and in summary is as follows:

Deep subsoiling of orchards acts as an investment to the owner.

SUBSOILER AND MOTIVE POWER.

The first large orchard subsoiler proved a failure, and a second one was constructed, but upon putting it to the test proved likewise inadequate; a third trial was made by a large manufacturing firm of southern California at the request of Mr. E. L. Tobin of Lindsay, California,

[1] Horticultural Inspector, Lindsay, California.

NOTE.—Credit is due Mr. E. L. Tobin for his earnest and untiring efforts, under extremely discouraging conditions, in his successful experiments of the feasibility of deep orchard subsoiling.

and a tool of two and one-half tons weight, with drums and cables arranged to hold the blade in the ground, and others to let it out at a moment's notice to avoid pipe lines, was constructed. This tool has stood the test under the most severe circumstances.

The submerging blade is five feet long, two inches in thickness, and is constructed of Norway steel, the best material for this purpose known to man. At the bottom of the blade is a "boot" or "shoe" four inches wide and two feet feet long, upon which is attached the point, which takes the brunt of the hardpan cutting. In an average day's operation this point must be replaced twice, as the hardpan has the same effect upon it as has the emery wheel.

The tool is pulled by two Holt tractors, hitched in tandem, a seventy-five horsepower machine in the wheel and one of forty-five horsepower hitched ahead. The "forty-five" Holt tractor has no tiller wheel and is capable of turning in a very narrow space by cutting the power on

Fig. 142. Close-up of subsoiling machine, showing details.

one track, thus serving as a pivot, while the other track is set into motion. On this account it is a simple matter for these two immense tractors with the heavy tool behind to turn in any tree row.

OPERATION.

The outfit is operated by a crew of six men, as will be seen in figure 142, and from ten to twelve acres a day are covered. The average depth of subsoiling with this tool is probably three feet ten inches, but the blade quite frequently goes to a depth of nearly five feet.

Excavations invariably have revealed that the hardpan is shattered through its total depth, and more or less broken up to a distance of from three to four feet on either side of the furrow, and in some instances even farther distances have been noted. The larger blocks of hardpan are pulled on to the surface by subsoiler when strata is near to ground level.

The cost to orchardist is $15 per acre for subsoiling two ways—that is, once between each tree row both directions in a checking manner. Some of the younger groves of the Lindsay district were subsoiled twice between each tree row about three feet from trees and then in an angling manner through the grove. This method affords a splendid opportunity, while the grove is young, to tear up all the hardpan. It required considerable more motive power for subsoiling the adobe and dry bog soils than hardpan soils on account of its close-grain, putty-like texture.

Approximately 1,000 acres of citrus, 150 acres of deciduous and 200 acres of raw land to be planted to grapes have been covered by the Tobin subsoiler in and around the Lindsay district.

At present the giant machine is engaged in tearing up several thousand acres of land on the J. C. Folkner Fig Gardens, near Fresno.

INTERESTING RESULTS.

The full benefit derived from the subsoiling of the orchards in the Lindsay district is not as yet fully discernible. In a certain orange grove of 10 acres which was subsoiled twice each row, an average of eleven wagon loads of hardpan were hauled from each tree row by the owner. On another grove of which accurate time was tabulated, it required just four times as long to get the water over the first time after subsoiling as it took previous to subsoiling, and a few days later the trees shot out more new growth than they had for over two years previous.

Fig. 143. Crevice made by subsoiler. This crevice is four feet deep.

On a certain hillside orange grove it was found almost impossible to raise a cover crop, and the owner did not plant last fall but had one-half of the grove subsoiled with the Tobin giant subsoiler. A splendid volunteer cover crop was the result on the portion subsoiled and grew to a height of three feet. There was a clear line of demarcation, however, between the half which was subsoiled and the half not subsoiled. On the latter the cover crop was either negative, as in most of the grove, or two inches high in spots.

CONCLUSION.

Although the total amount of benefit derived from deep subsoiling in orchards at present has not been realized, owing to the fact that the time has not been sufficient for this, it is, however, very evident to one who is familiar with orchard conditions in general, that deep subsoiling

will prove to be a necessary treatment for practically all orchards in order to permit of proper development.

Fig. 144. Crevice made by subsoiler on "the turn."

Better orchards today would be seen if deep subsoiling had been adopted, where tree rows occur, before planting.

To the orchardist who has given but little thought to the matter of subsoiling, it might be advisable to mention that the benefits derived from this treatment are of four kinds, viz: 1. Permitting of deep soil aeration; 2. Increasing rooting area; 3. Controlling root area (thus eventually encouraging uniformity of size of trees); 4. Improving soil drainage conditions, thus providing for the leaching of soils containing alkali salts, which have accumulated above the hardpan stratum.

A large portion of the red loam soils lying adjacent to the foothills in Tulare County possess strata of hardpan, lying from a few inches to two feet below the surface and ranging in thickness from a few inches to nearly two feet. Below this hardpan is invariably found a splendid loam which is capable of furnishing a large amount of plant food, providing overlying hardpan is broken up to permit of root penetration.

EDITOR'S NOTE: 1. It might be well to point out that in many cases the thickness and density of hardpan might be so great as to preclude the successful operation of a subsoil plow, and also in cases where the subsoil is underlaid by dense clay, the subsoiling operation might not be satisfactory since the roots would be unable successfully to penetrate the material beneath the hardpan.

2. Unless the success of such a machine as that described was thoroughly demonstrated, it would not be advisable for one to invest in hardpan land with the sole idea of reclaiming it by subsoiling. If, on the other hand, a machine has been produced which will successfully break up hardpan that is two feet or more in thickness, it will make available many thousands of acres of land that heretofore have been of little value for the production of crops.

3. A word of caution should be added in the use of the subsoiler on heavy soils, clay or clay adobes, when the subsoil is wet. They would be likely to cause more injury than benefit from their tendency to puddle. Subsoilers should always be used when the land is dry except in cases where the soil is light and the subsoiler is being used especially to break up the hardpan, in which case, its use on moist soil might not be detrimental.

BOOKS OF INTEREST TO GROWERS AND HORTICULTURAL OFFICIALS.

Outlines of Economic Zoology,[1] by A. M. Reese. [316 pages, 194 illustrations.] The author aims to give in concise form an outline of the economic status of members of the animal kingdom, other than insects. Entomology, he states, is a large department of science in itself, there being more species of insects known than of all the other groups of animals combined. The book is interestingly written and, for the economic zoologist, forms a useful supplement to the many treatises on entomology which are now available. Among others there are chapters on protozoa, the sponges, worms, mollusks, crustaceans, a brief one on insects, fishes, reptiles, birds and mammals.—HARRY S. SMITH.

[1]P. Blakiston's Son & Co., Philadelphia.

FIG PICKING TIME IN CALIFORNIA.

CROP REPORT AND STATISTICS.

MONTHLY CROP REPORT.

STATE DEPARTMENT OF AGRICULTURE.

Compiled in co-operation with U. S. Bureau of Crop Estimates, San Francisco, from Reports of County Horticultural Commissioners and Government Crop Reports.

August 30, 1919.

Counties	Almonds (per cent)	Apples (per cent)	Apricots* (per cent)	Figs (per cent)	Grapes (per cent)	Lemons (per cent)	Olives (per cent)	Navel Oranges, %	Valencia Oranges, %	Peaches (per cent)	Pears (per cent)	Plums* (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	25	#	65	#	100	#	#	#	#	#	95	60	90	#
Butte	60	100	#	100	#	#	60	50	#	100	40	#	75	#
Colusa	80	#	#	#	#	#	#	#	#	#	#	#	90	#
Contra Costa	30	#	90	#	100	#	80	#	#	90	100	#	90	#
El Dorado	#	#	#	#	#	#	#	#	#	#	80	100	#	#
Fresno	#	#	105	108	100	85	60	80	#	101	#	95	100	#
Glenn	95	#	90	#	#	#	#	#	#	#	#	#	90	#
Humboldt	#	90	#	#	#	#	#	#	#	#	#	#	#	#
Inyo	#	55	#	#	#	#	#	#	#	#	#	#	#	#
Kern	#	#	105	#	101	#	#	75	#	100	105	#	100	#
Kings	#	#	100	#	100	#	#	#	#	101	#	#	100	#
Lake	90	#	#	#	#	#	#	#	#	#	100	#	100	#
Los Angeles	90	90	100	100	100	75	90	60	65	100	70	80	#	107
Madera	#	#	90	100	100	#	40	#	#	100	#	#	#	#
Mendocino	#	85	#	#	100	#	#	#	#	#	95	#	85	#
Merced	100	#	100	101	95	#	85	#	#	95	#	#	#	#
Monterey	#	95	75	#	#	#	#	#	#	#	#	#	#	#
Napa	60	100	50	#	100	#	70	#	#	100	100	100	100	#
Nevada	#	80	#	#	#	#	#	#	#	#	50	80	#	#
Orange	#	#	100	#	#	82	#	70	80	#	#	#	#	108
Placer	50	85	#	#	#	#	60	#	#	100	65	65	#	#
Riverside	85	75	120	#	95	70	55	60	65	95	70	#	#	100
Sacramento	85	#	95	#	100	#	70	50	#	95	100	90	90	#
San Benito	85	90	85	#	#	#	#	#	#	#	95	#	105	#
San Bernardino	#	100	105	#	90	65	85	58	68	100	#	#	#	100
San Diego	#	100	105	#	85	75	45	#	#	#	#	#	#	#
San Joaquin	80	#	100	80	100	#	100	#	#	100	60	100	100	95
San Luis Obispo	100	#	#	#	#	#	#	#	#	#	#	#	#	100
Santa Barbara	#	#	#	#	#	80	#	#	#	#	#	#	#	105
Santa Clara	100	100	90	#	95	#	#	#	#	100	100	#	110	100
Santa Cruz	#	85	75	#	#	#	#	#	#	#	85	#	#	#
Shasta	#	#	#	#	#	#	30	#	#	#	#	#	100	#
Siskiyou	#	90	#	#	#	#	#	#	#	#	#	#	#	#
Solano	50	#	90	#	90	#	#	#	#	95	95	90	85	#
Sonoma	#	95	80	#	100	#	90	#	#	90	100	90	100	100
Stanislaus	115	#	100	100	100	#	95	#	#	100	90	#	#	#
Sutter	90	#	#	100	95	#	#	#	#	110	#	#	90	#
Tehama	100	#	100	#	#	#	80	#	#	100	85	90	90	#
Tulare	#	#	105	102	100	90	40	58	75	100	#	105	108	#
Ventura	#	#	100	#	#	75	#	30	#	#	#	#	#	105
Yolo	80	#	100	100	100	#	60	#	#	100	80	100	85	#
Yuba	60	#	#	100	#	#	110	#	#	#	110	80	#	#
State	75	89	95	102	100	75	68	59	71	100	93	90	108	106

*The figures in the columns for plums and apricots represent production rather than condition.
#Not grown commercially.

MONTHLY CROP REPORT.

STATE DEPARTMENT OF AGRICULTURE.

Compiled in co-operation with U. S. Bureau of Crop Estimates, San Francisco, from reports of County Horticultural Commissioners and Government Crop Reports.

September 30, 1919.

Counties	Almonds (per cent)	Apples (per cent)	Figs (per cent)	Wine grapes (per cent)	Raisin grapes, %	Table grapes (per cent)	Lemons (per cent)	Olives (per cent)	Navel oranges, %	Valencia oranges, %	Pears (per cent)	Walnuts (per cent)
Alameda	25	#	#	100	#	100	#	#	#	#	100	#
Butte	60	100	105	#	#	#	#	60	60	#	50	#
Calaveras	#	#	#	100	#	#	#	#	#	#	#	#
Colusa	90	#	#	#	#	90	#	#	#	#	#	#
Contra Costa	30	#	#	100	#	#	#	80	#	#	100	#
El Dorado	#	#	#	#	#	#	#	#	#	#	90	#
Fresno	#	#	105	100	98	100	85	60	80	#	#	#
Glenn	95	#	#	#	#	#	#	#	#	#	#	#
Humboldt	#	90	#	#	#	#	#	#	#	#	#	#
Inyo	#	60	#	#	#	#	#	#	#	#	#	#
Kern	#	#	#	#	104	#	#	#	75	#	110	#
Kings	#	#	#	#	90	#	#	#	#	#	#	#
Lake	90	#	#	#	#	#	#	#	#	#	100	#
Los Angeles	90	95	95	100	#	100	72	70	61	68	80	107
Madera	#	#	100	100	110	#	#	50	#	#	#	#
Mendocino	#	85	#	100	#	#	#	#	#	#	95	#
Merced	95	#	100	100	#	100	#	80	#	#	#	#
Monterey	#	100	#	#	#	#	#	#	#	#	#	#
Napa	50	100	#	100	#	#	#	70	#	#	100	#
Nevada	#	80	#	#	#	#	#	#	#	#	80	#
Orange	#	#	#	#	#	#	98	#	68	84	#	106
Placer	50	85	#	100	#	100	#	60	#	#	65	#
Riverside	35	70	#	95	#	95	72	55	60	65	70	100
Sacramento	85	#	#	100	#	100	#	60	55	#	100	#
San Benito	85	90	#	#	#	#	#	#	#	#	100	#
San Bernardino	#	105	#	90	90	90	65	85	58	60	#	100
San Diego	#	100	#	80	80	80	75	45	#	#	#	#
San Joaquin	70	#	100	100	#	100	#	80	#	#	60	90
San Luis Obispo	100	#	#	#	#	#	#	#	#	#	#	95
Santa Barbara	#	#	#	#	#	#	80	#	#	#	#	90
Santa Clara	100	100	#	90	#	90	#	#	#	#	100	100
Santa Cruz	#	85	#	100	#	#	#	#	#	#	90	#
Shasta	#	#	#	90	#	#	#	20	#	#	#	#
Siskiyou	#	90	#	#	#	#	#	#	#	#	#	#
Solano	60	#	#	100	#	80	#	#	#	#	95	#
Sonoma	#	95	#	105	#	100	#	#	#	#	90	90
Stanislaus	115	#	100	105	#	90	#	95	#	#	90	#
Sutter	90	#	100	#	100	#	#	#	#	#	100	#
Tehama	90	#	#	90	#	#	#	75	#	#	85	#
Tulare	#	#	105	#	95	95	90	40	58	75	#	#
Ventura	#	#	#	#	#	#	80	#	30	#	#	105
Yolo	85	#	85	100	#	100	#	75	#	#	80	#
Yuba	60	#	100	#	#	#	#	110	#	#	110	#

#Not grown commercially.

QUARANTINE DIVISION.

OFFICE OF PLANT QUARANTINE.

REPORT FOR THE MONTH OF AUGUST, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	76
Passengers arriving from fruit fly ports	4,196

Horticultural imports:

	Parcels
Passed as free from pests	156,062
Fumigated	2,763
Refused admittance	45
Contraband destroyed	38
Total parcels horticultural imports for the month	158,908

Pests Intercepted.

From Central America:
Aspidiotus sp. on bananas.

From China:
Weevil (undetermined) in seed.

From Hawaii:
Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples
Dacus cucurbitæ in green peppers and cucumbers.
Larvæ of Trypetid (undetermined) in tomatoes.
Coccus longulus on betel leaves.
Cylas formicarius in sweet potatoes.

From Japan:
Lepidopterous larvæ in herbs and roots.
Lepidopterous larvæ in dried fruit.

From Mexico:
Tribolium ferrugineum and *Formicid* sp. in corn meal.
Undetermined formicid in Guamuchil seed.

From New York:
Sitrodrepa panicea in coriander seed.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	25
Fish boats inspected	1
Passengers arriving from fruit fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	49,873
Fumigated	61
Refused admitttance	12
Contraband destroyed	11
Total parcels horticultural imports for the month	49,957

Pests Intercepted.

From Central America:

Pseudococcus sp. and *Aspidiotus cyanophylli* on bananas.

From Hawaii:

Diaspis bromeliæ on pineapples.
Larvæ of *Bactrocera cucurbitæ* in cucumbers.

From Mexico:

Ischnaspis longirostris on mangoes.

From Oregon:

Tetranychus sp. and *Aspidiotus perniciosus* on pears.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	19
Fish boats inspected	33
Passengers arriving from fruit fly ports	10

Horticultural imports:	Parcels
Passed as free from pests	2,964
Fumigated	0
Refused admittance	0
Contraband destroyed	0
Total parcels horticultural imports for the month	2,964

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli and *Pseudococcus* sp. on bananas.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	6
Passengers arriving from fruit fly ports	0

Horticultural imports:	Parcels
Passed as free from pests	0

OFFICE OF PLANT QUARANTINE.

REPORT OF THE MONTH OF SEPTEMBER, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	69
Passengers arriving from fruit fly ports	3,249

Horticultural imports:	**Parcels**
Passed as free from pests	172,146
Fumigated	3,093
Sterilized	11,129
Refused admittance	32
Contraband destroyed	33
Total parcels horticultural imports for the month	186,433

Pests Intercepted.

From Central America:

Pseudococcus sp., *Aspidiotus* sp. and undetermined formicids on bananas.

From China:

Lepidopterous larvæ in shelled peanuts and yams.
Calandra oryzæ and *Tenebroides mauritanicus* in maize.

From France:

Mite (undetermined) on lily bulbs.

From Hawaii:

Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Coccus longulum on betel leaves.

From Japan:

Larvæ of borers in filberts.
Formicid (undetermined) on dry root material.

From Jerusalem:

Chrysomphalus sp. and *Pseudococcus citri* on citron.

From Michigan:

Laspeyresia pomonella in apples and pears.

From Nevada:

Heterodera radicicola in potatoes.

From Oregon:

Laspeyresia pomonella in pears.
Scab and Rhizoctonia on potatoes.

From Papeete:

Pseudococcus sp. on cocoanuts.

From Tahiti:

Lepidosaphes beckii on oranges and limes.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	22
Fish boats inspected	1
Passengers arriving from fruit fly ports	25

Horticultural imports:	**Parcels**
Passed as free from pests	63,994
Fumigated	44
Refused admittance	5
Contraband destroyed	11
Total parcels horticultural imports for the month	64,054

Pests Intercepted.

From Belgium:
Coccus hesperidum and *Aspidiotus britannicus* on bay trees.

From Central America:
Aspidiotus cyanophylli and *Pseudococcus* sp. on bananas.

From New York:
Parlatoria pergandii on citrus tree.

From Oregon:
Aspidiotus perniciosus and *Cydia pomonella* on apples.

From Rhode Island:
Diaspis boisduvalii, Aspidiotus hederæ and *Cerataphis latanie* on orchids.

From Utah:
Laspeyresia pomonella on pears.

From Virginia:
Storage moths on peanuts.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	41
Fish boats inspected	80
Passengers arriving from fruit fly ports	49

Horticultural imports:

	Parcels
Passed as free from pests	2,497
Fumigated	0
Refused admittance	1
Contraband destroyed	0
Total parcels horticultural imports for the month	2,498

Pests Intercepted.

From Central America:
Aspidiotus cyanophylli on bananas.

From Washington:
Aspidiotus perniciosus and *Cydia pomonella* on pears.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	3
Passengers arriving from fruit fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	3

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Volume VIII Number 10

MONTHLY BULLETIN
OF THE
DEPARTMENT OF AGRICULTURE
STATE OF CALIFORNIA

WHY WE MUST FOSTER AGRICULTURE

"It is not alone in the production of eatables that the farmer is important! He is the bulwark of governments and of peace and order! I cannot point to a more advantageous use of public funds or employment of the energies of the state officials than aiding the farmer to grow more bountiful crops and to protect them until the harvest time!"

—GOVERNOR WM. D. STEPHENS.

SACRAMENTO, CALIFORNIA OCTOBER, 1919

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Governor Wm. D. Stephens.

THE MONTHLY BULLETIN

DEPARTMENT OF AGRICULTURE

STATE OF CALIFORNIA

DEVOTED TO AGRICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

G. H. HECKE, Director----------Censor

BRONTE A. REYNOLDS, Assistant Secretary----------Editor

Entered as second-class matter October 6, 1919, at the post office at Sacramento, California, under the act of June 6, 1900.

Vol. VIII | OCTOBER, 1919 | No. 10

WHY WE MUST FOSTER AGRICULTURE.

By WM. D. STEPHENS, *Governor of California.*

Never before in the history of the world has the realization of humanity's utter dependence on the agriculturist been so acute as it is today.

The critical situation of civilization in these times will be determined as the farmer may succeed in providing food. And it is not alone in the production of eatables that the farmer is important. He is the bulwark of governments and of peace and order.

I look for a rapid emergence of our country from the topsy-turvy conditions the great war created. I have an abiding faith in our people. And it is in the good "horse sense" of the American farmer that much of my reliance is placed.

I regard it as essential not only as a matter of fair play and just attention, but also as an urgent demand for the well-being of all the people, that city and townspeople, as well as the country population itself, give aid and direction generously and energetically through our governmental agencies in the promotion of agricultural industry.

Solution of the high cost of living lies largely in increased and better production upon our farms.

During my administration as Governor I hope to bring about an important expansion of activities for the benefit of land production.

We have made an excellent beginning in the recent creation of the Department of Agriculture, and, frankly, I have great expectations as to what it will be able to achieve. All agencies of the state government dealing with agriculture have been brought into one organization and the co-ordination that has resulted is highly gratifying. System and economic administration have been worked out in most satisfying fashion.

As I had expected, a new zeal has been engendered in the various branches that were thus placed in one department. Co-operation and

"team work," such as were not possible when they functioned as separate units, are now the natural scheme of things. Each branch has been striving its utmost, under separate statutes, filling its own little sphere, and handicapped in its efforts to obtain the encouragement and aid that were needed to cope with the problems that came thick and fast.

Now they are all part of a strong organization which will be formidable in commanding attention to the needs of agriculture and will constitute a new driving force for effective accomplishment.

There is in this work of our Department of Agriculture a great field for service. The value of science and expert authority is now generally appreciated.

The battle with pests must be maintained vigorously, and in the future our legislatures must make more liberal appropriations for this work. The state must make a beginning in keeping its highways free of noxious weeds and grasses, and then the demand must be made that the same be done on county roads. Irrigation and canal companies must likewise be required to stop the spread of these weeds and grasses that have become so serious a menace.

Following the adjournment of the last legislature, I approved small appropriations for experimentation against a new pest in the walnut groves and for inspection of seed potatoes. It was a problem to provide even these small sums.

I am not content with the mere issuance of bulletins for the enlightenment and instruction of farmers. Our state officials must carry their work directly to the farmer, and he must receive his information and counsel through personal contact and open demonstration.

I can not point to a more advantageous use of public funds or employment of the energies of the state officials than aiding the farmer to grow more bountiful crops and to protect them until the harvest time.

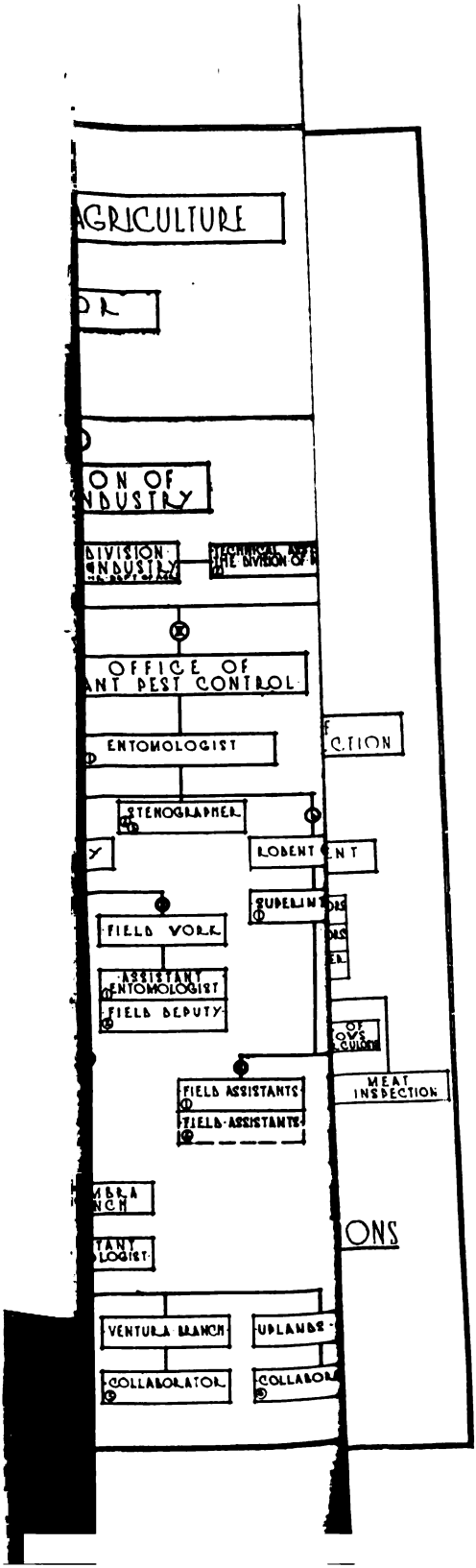
AGRICULTURAL ACTIVITIES CONSOLIDATED.

By G. H. HECKE, *Director of Agriculture.*

The closing days of the legislative session of 1919 gave birth to one measure vitally affecting the future agricultural development of California. Upon the strong initiative of Governor Stephens, the creation of the California Department of Agriculture was effected, for the purpose of obtaining greater efficiency and a more economical system of dispensing state regulatory measures, through the consolidation of the many bureaus, boards and commissions, which, heretofore, had operated independently.

The several distinct organizations brought together by this action involve—

Office of State Commissioner of Horticulture;
Board of Viticultural Commissioners;
Office of State Veterinarian;
State Board of Cattle Protection;
State Dairy Bureau;
Offices administering the Insecticide and Fungicide Act, and the Fertilizer Act.



Under the provisions of the bill (A. B. 1112), the Director of Agriculture thus finds himself engaged in a much broader field of work, definitely outlined and clearly established by legislative action.

The work heretofore conducted by these independent organizations will be continued, and notwithstanding the necessity of making an effective saving over the cost of conducting the former disconnected work, an aggressive campaign is being pursued to make the services of the new Department more valuable to the agricultural interests of the state.

SUMMARIZED WORK OF THE DIFFERENT BRANCHES.

The branches of the work within the Department represent the application of the laws of the state for the protection of the different phases of agriculture. These laws are of a regulatory nature, dealing with the inspection service of the plant and animal industries for the purpose of enforcing the standardization of plant and dairy products, the protection of the cattlemen, and preventing the introduction into the state of plant and animals pests and diseases and controlling those that already exist.

The Department of Agriculture is assuming a large responsibility in endeavoring to carry on the work outlined on a budget less, by approximately $40,000, than was the combined resources of the former independent offices—and this in the face of an increased demand for services and the necessity for providing a better living wage to our employees, thus making quite an increase in salary expense.

It is expected to accomplish this and give at least the same efficient service as was given before consolidation. We will endeavor to do it by preventing overlapping, by combining, for instance, the cattle inspection with the dairy inspection wherever possible, and rodent control with pest control, and by bringing the headquarters of the former commissions, boards, and bureaus together in one building in Sacramento.

The new Department of Agriculture is fully aware of the danger that may come to the state in proceeding in this important police work without adequate personnel or sufficient equipment; but we know that the result of the trial will demonstrate the wisdom of the plan and at the same time convince the next legislature that the equipment and working force of the Department must be commensurate with the responsibilities assumed.

In addition to its other duties, the executive office maintains direct contact with the prominent schools, departments of agriculture, and scientific associations of the world, and is thus enabled, through its system of news letters, to place before the press, the public schools, and the county officials such first hand information regarding the many phases of agriculture as is deemed necessary properly to promote and foster the needs of the industry.

THE DIVISION OF ANIMAL INDUSTRY.

In the Division of Animal Industry the work of the veterinarians and dairy inspectors, formerly separate, has been combined wherever advisable. The administration of the various offices which have been brought into the Division has also been combined and simplified, and the executive office is taking over much of the work of such offices as rapidly as

conditions will permit. Owing to the lack of housing facilities, the Office of Cattle Protection remains at San Francisco for the present, but eventually will be brought to Sacramento. The investigation and suppression of the deadly anthrax and other contagious diseases of dairy and range cattle come under the scrutiny of this office.

THE DIVISION OF AGRICULTURAL CHEMISTRY.

The Division of Agricultural Chemistry will remain at the University of California until July 1, 1920, by special arrangement with that institution, due to lack of funds and proper housing facilities. It will be brought to Sacramento, thereby effecting further economy in administration.

THE DIVISION OF PLANT INDUSTRY.

The Division of Plant Industry is under the direct supervision of the Director of Agriculture, thus effecting a substantial saving of possibly $4,000 per annum to adequately provide for such an official. The Pest Control office has imported, reared and distributed millions of beneficial parasites and ladybirds to growers of fruits and vegetables and thus forestalled losses to these crops that if expressed in figures would seem incredible.

Through the persistent activity of the rodent control force several counties have eradicated the expensive ground squirrels, many other counties are making progress toward eradication and the educational value of the work is far-reaching and valuable. The rodent control work, formerly carried on independently, is now absorbed by the Office of Pest Control. The Office of Viticulture takes over the work of the former Board of Viticultural Commissioners, and by co-ordination with the other branches of the Division of Plant Industry it is rendered more efficient and a considerable financial saving is effected.

The Office of Standardization was created to take charge of the enlarged work thrust upon the Department by the fruit and vegetable standardization laws. This is one of the important lines of work and will pay for itself many times over in the stabilization of market conditions for the producer as well as the consumer.

The work of the Quarantine Office is of the utmost importance. Through the effectiveness of such service in keeping out plant pests, California stands today as the first fruit producing land in the entire world; it might have been otherwise except for the foresight of our pioneers who, by establishing the first real quarantine system, succeeded in preventing the introduction of the majority of plant pests which, if allowed to get a foothold, would demote the California plant industry to a much lower rank. The work of this office therefore represents the most valuable insurance, and must be kept up and increased in efficiency.

Thus the creation of the California Department of Agriculture stands today as one of the most important measures ever undertaken for the broader promotion of the agricultural industry of the state. Based upon the experience of past years and the foundation prepared by our earlier activities, there is every reason to look forward to the ultimate successful operation of the many projects now involved by the new Department.

FAILURE TO CONVICT FOR VIOLATIONS OF STANDARDIZATION LAWS.

By GEORGE P. WELDON,[1] Ontario, California.

There have been many convictions and some quite heavy fines for violation of both the apple and the fresh fruit standardization laws since the passage of the original measures in 1915. Sometimes, failure to secure a conviction has resulted from hastiness in causing arrest and failure to take account of details which in court mean so much toward proving the guilt of the accused. Everyone is innocent until he has been proved guilty before a judge or jury. When a complaint is sworn out against a violator by an inspector who knows that a violation has been committed, said inspector should not allow his knowledge and his judgment to place him in a position where he feels that a conviction will be sure and easy. What is plain to him may not be plain to the judge or the jury, and too many facts bearing on the case can not be secured.

Whenever an arrest is made, the party causing same should stop to consider that the accused may not plead guilty, no matter how plain or how serious the offense. He may, also, call for a jury trial, in which case six men and six women, or at least twelve people, will have to be shown that he is guilty. Plenty of evidence and plenty of witnesses are therefore desirable. If fruit is seized, the inspector should be able to account for it every day during the interim between time of seizure and time of the trial. In other words, if it leaves his hands there should be witnesses who could swear that it is the same fruit that was seized by the inspector, and that at no time had it been possible for anyone to place any other fruit in the containers, or to interfere in any way with that already within. Perhaps there should be a seal used by state and county standardization officials, to be placed on boxes of condemned fruit which might not be broken until the boxes were opened in court. Absolute proof that the same fruit which was condemned and sealed in the presence of certain witnesses might then be had.

Caution against hasty arrests is probably not frequent enough among those in authority. Because the law empowers an inspector to cause an arrest does not mean necessarily that the only way out of a difficulty is to cause an arrest.

Arrests are necessary in extreme cases, but frequently settlement can be made out of the courts and the penalty for the offender may be even greater.

WHAT STANDARDIZATION MEANS TO THE CONSUMER.

By BRONTE A. REYNOLDS,[2] Sacramento, California.

Opponents of the California Standardization Law—mercenary tradesmen and a few unscrupulous fruit growers and farmers—in mock solicitation confided to the public at large that the enactment of stand-

[1] Consulting Horticulturalist, California Department of Agriculture.
[2] Editor, Department of Agriculture, State of California.

ardization measures would result in a higher price for a given fruit and vegetable to the consumer.

Let us analyze the situation under the prevailing conditions and see what really did happen!

Prior to the enactment of the meritorious legislation fostered alike by the old Horticultural Commission and now by the authority of the State Department of Agriculture, the hotel buyer, the grocer and the housewife approached the markets and engaged in a merry warfare for bargains. The keynote, unfortunately, of these sporadic expeditions was to secure the largest amount of a given fruit or vegetable for the smallest outlay of cash.

The purchaser went into the market with his eyes open, and the battle of his wits against the long-time cunning of the seller could have but one ending—the consumer got the small end of the bargain!

The odds against the consumer were almost as great as those encountered by the unwary in any open gambling game. The boxes, pans and lugs were faced with showy, desirable specimens of fruit, berries and vegetables exposed to view. Under the top layers were to be found misshapen, ill-assorted, green, rotten, small, immature products, with possibly a generous admixture of leaves, stems and trash—anything to give bulk to the package or container. Under stress of impending competition, many a purchaser has concluded his "bargain" to find, when he made a careful summing up at home, that he had paid very dearly for that portion redeemable under "salvage" operations, and was firmly persuaded that he could have done better to purchase fruits and vegetables of a superior grade at a higher market price. But did the lesson "take root?" It did not! Next market day we find the same purchaser, in the same market place, and the same offending salesman—but with a new box of tricks to play. Perhaps it is "stove-piped" corn in the sack, or a deceptive box with a false bottom, or a lot of apples or pears with worms tucked away in them!

Under the new standardization laws as enacted by the last legislature and now being enforced by the State Department of Agriculture, much of the petty graft and deception practiced upon the consumer is gradually narrowing to the point where the buyer may receive, in trade, at least a larger return for his investment than was possible under the old conditions.

Thus we have before us the task of disseminating the great fundamental lesson that "honesty is the best policy."

The native farmer and fruit grower will come to realize that the precepts laid down by the standardization laws are the best advertisement for his wares! The alien farmer and fruit grower must be educated by a generous system of doubling up the fines every time he is convicted for violation of the Standardization Law! The consumer will be educated to see that a "bargain" is never a bargain, and that to expect "something for nothing" is illogical and unreasonable!

Also, we must disseminate within the state the firm principles of fair dealing, so that when our business calls to us from outside the state, the state will have no cause to be ashamed, but will maintain with justifiable pride her position in the industrial world.

Thus may be seen, in part, the great good to be had from the standardization laws of the California Department of Agriculture.

RODENT CONTROL OUTLOOK FAVORABLE.

By W. C. JACOBSEN,[1] Sacramento, California.

While it must be generally admitted that war-time activities brought added interest to operations in the control of crop pests, perhaps no phase of this important work received greater recognition than that dealing with rodent pests. For a number of years the need for destroying these notorious marauders became more and more apparent, owing to the encouragement that was given them by the creation of a more readily available food supply through intensive cultivation of crops. Artificial conditions brought about an enormous increase in the rodent hordes, which in some localities became so numerous as to be termed quasi-plague. Gradually states and counties realized the need for protection against the continued invasions of these pests, and about the middle of the present decade, 1910–1920, comes the work being received with a very open mind. Many of the Western states had taken up methods and means of combatting this cause for an annual crop loss but generally with no particular action on their part to maintain a trained supervision. The necessity for competent guidance was very plainly demonstrated when, during war time, a rather large appropriation was set aside to remedy as much as possible a loss of food crops. Fortunately a foothold was gained in a great many states west of the Mississippi, until the total expenditures for rodent control work for the last year amounted to over $700,000. These were funds from federal, state and county sources and, to a limited degree, from co-operative organizations interested in this phase of food saving. A very fortunate circumstance has been the outcome of the extensive work carried on, namely, that practically all of the states have maintained the entire force which was placed during the emergency period. This is particularly true in California where the total expenditures for the past year of all agencies concerned will approximate $350,000. Unfortunately, the state appropriation to be used by the State Department of Agriculture through its Rodent Control section has been decreased in order to meet the requirements of other departments, but many of the counties have increased their allotments for the use of their horticultural commissioners. Another phase of the work, while not entirely new, is being revived in California by the United States Public Health Service in combatting ground squirrels for the safety of public health. For the balance of the fiscal year of 1920, they have an appropriation of nearly $70,000 to be expended in the ten counties of California where bubonic plague has been known to exist at periods since 1908. This means then that we have five important public agencies interested in this work in California at the present: For the Federal government, the Biological Survey of the United States Department of Agriculture, the Public Health Service of the United States Treasury Department; of the state agencies, the State Department of Agriculture, the State Board of Health co-operating with the Public Health Service, and finally the county horticultural commissioners of fifty-one counties in California. Witness this in comparison with the

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THE ACHEMON SPHINX MOTH.[1]

(*Pholus achemon* Drury.)

A PEST OF THE GRAPE IN CALIFORNIA.

By R. L. NOUGARET,[2] Sacramento, California.

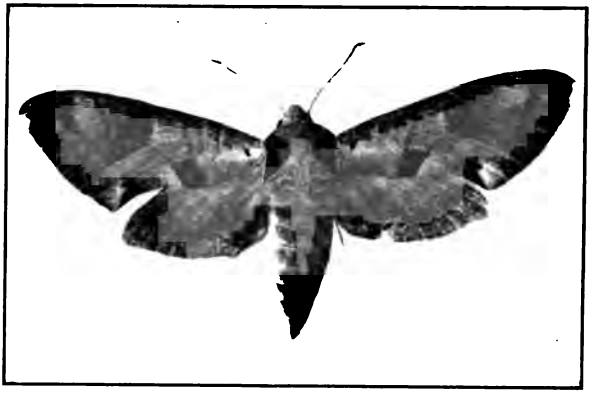

FIG. 146.—The Achemon sphinx moth (*Pholus achemon*): Adult female moth. Four-fifths natural size. (U. S. Dept. of Agriculture.) Original.

FOREWORD.

A unique opportunity presented itself in the outbreak of the Achemon sphinx moth throughout the vast acreage of vineyard on the Martin ranch at Rayo, in Tulare County, to try out a method of control. It spread over an area of considerable extent in an uninterrupted manner, varying only in degree of a more or less serious infestation.

The writer, at that time stationed in Fresno, California, was engaged in work for the Bureau of Entomology of the United States Department of Agriculture and was assigned to grape insect investigations. Upon the request of the owner of the ranch to try to save a crop which, figured on a basis of loss sustained the previous year when only a small acreage had been damaged, now threatened to be a most serious one, a method of control was hastily planned and proved to be very successful. There appears to be no record of this method of control having been previously applied; consequently it deserves to be considered an original work and full credit for it should be given to the United States Bureau of Entomology. The photographs here reproduced are original and all

[1] Family Sphingidæ; subfamily Philanpelinæ.

[2] In charge of the Office of Viticulture, California State Department of Agriculture.

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were taken by the writer with the exception of two, the property of Paul R. Jones, who, being interested in insect control, closely followed the work. The negatives of the same subjects, taken by the writer, were accidentally broken during transportation and Mr. Jones kindly loaned his to take their place.

HISTORY.

The moth is found throughout the vine growing districts of California, more abundant perhaps in the warmer centrally located valley of the San Joaquin, where local sporadic outbreaks of this insect occur from time to time. Although its habitat is not confined to the Pacific coast, it is reported present in all parts of the United States and Canada where grapes are grown; yet outbreaks of this pest have not been recorded outside of California.

The writer witnessed one of these outbreaks in Kings County in 1918 in a Muscat vineyard of about twenty-five acres, three-quarters of which was badly defoliated by the worm of this moth in the latter part of July at a time when the grapes were beginning to sweeten, containing from 14 per cent to 16 per cent sugar. When discovered, the great majority of the worms were about fully grown, and specimens of these, collected at that time and kept under observation in the laboratory, entered the soil to pupate August 6, 9 and 10.

At that season of the year vines are still in an active state of vegetation; a week to ten days hardly elapsed before the vines put forth a new growth of leaves. The grapes acquired apparently a normal maturity. The Balling saccharometer test indicated a sufficient percentage of sugar. When the grapes were picked they were somewhat undersized, but when dried were commercially accepted as a B grade raisin.

It was feared grapes so exposed would sunburn. A portion of the defoliated vines were protected from the sun on the southwest side by grape drying trays with the idea of preventing the grapes from shriveling up or burning. Grapes from these vines proved to be little, if any, benefited by this protection. They were no larger in size, no firmer in texture, nor did they contain a higher appreciable percentage of sugar than did those of the vines that had not been protected by the trays. It must be said that this work was not carried on as a scientific experiment, but merely by the owner as a commercial field work in trying to save his crop the best way he could imagine. Hence, climatic conditions were not noted, nor was a chemical analysis made for true sugar content. The Balling saccharometer is based upon the principle of specific gravity of liquids. In testing the sugar content of grapes by means of the Balling spindle, the readings, translated into corrected degrees or percentages of grape sugar or glucose which the juice is supposed to contain, are only approximate, and are reliable under normal conditions, other substances than glucose being capable of causing an error. In this case a certain quantity of gummy substance was likely to have been produced instead of glucose by the abnormal process of ripening. The Balling test would not take cognizance of this substitution and the reading would be made in degrees of sugar while a chemical analysis would have given a different result for the true sugar content.

Be that as it may, the grower received very good returns for that which he feared would be a total loss. A hot spell of a few days (not uncommon in Kings County during the month of July) would probably have shriveled and dried up or burnt the grapes and again given different results; however, this is only speculative as no data upon this subject is available.

Another outbreak of this moth which at the time was called to the attention of the writer occurred in 1914 near Escalon, San Joaquin County, in a vineyard of "Ladyfinger" grapes. Here again the presence of the worms was discovered only after vines were badly defoliated. The majority of these larvæ were about full grown and

FIG. 147.—Grapevines defoliated by larvæ of the Achemon sphinx moth. (U. S. Dept. of Agriculture.) Original.

many had already entered the ground—too late, in fact, to go to the expense of trying any means of control when so many worms were already beyond the reach of a practical remedy to control the pest in the larval stage. The immediate discovery of the worms in a vineyard almost simultaneously with the defoliation of the vines may create in the mind of the reader some false impression, either as to the sporadic nature of the infestation, or in regards to the care given the vineyard, presuming negligence to be responsible for the presence of the insect not being discovered sooner. An explanation of this fact will be found in another part of this paper treating of the injury caused by the insect.

With the idea of producing new leaves rapidly, and in abundance, in order to save the crop, irrigation in this instance was resorted to,

and probably applied to some excess. The seasonal date of this outbreak corresponds closely with that of the outbreak in Kings County in 1918. The water had the effect of forcing out, within a few days time, a healthy growth of leaves. To all appearances the grapes showed no ill effects of having been exposed to the sun, and there had been no check in their development; nevertheless, they failed to attain the normal percentage of sugar. The size of the berries compared very favorably with that of former years; but they were too juicy (watery) to stand shipment to any distance; consequently they were not marketable and the crop was practically a total loss.

FIG. 148.—Method of spraying for Achemon sphinx moth control on the Martin vineyard, Tulare County, California. (Paul R. Jones.)

Because of the great number of pupæ which could be uncovered by a light scratching of the soil, it was feared that another serious infestation would result the following year. Hand-picking of the worms had been found impracticable, and in order to reduce, if possible, the number of pupæ, a band of turkeys was turned into the vineyard and a shallow cultivation was performed on a width of several feet on both sides of the row of vines, and close up to them. This was a means of uncovering and of bringing to the surface many pupæ which otherwise would have remained inaccessible to the birds, who found them very much to their taste and thus destroyed many. Owing to ensuing mortality of the birds this control measure can not be recommended. The tough shell of the pupa was indigestible, and many of the birds became sick and died. Upon opening the gizzard it was found that the small, sharp hard point at the caudal end of the abdomen of the pupa had pierced this muscular organ and was responsible for the death.

In other respects, cultivation by disking, harrowing, or even plowing, at that time of year when the ground is in a loose and friable condition gives but poor results in regards to destroying the pupæ which are buried. The loose earth offers no resistance for crushing the insect in that form. So it was decided to wait until the winter rains had thoroughly soaked the ground and made it compact, thereby giving to

FIG. 149.—Replenishing spraying machines from an irrigation ditch. (U. S. Dept. of Agriculture.) Original.

it the required resistance to obstruct the plowshare or cultivator tooth, and thus crush the pupæ which by that time would be firmly imbedded in the ground. For this reason, control measures were postponed until the following spring, when this plan was carried out.

Plowing was started early the following spring while the ground was still quite moist. Contrary to expectation, a small proportion of the pupæ only were being destroyed. The plowed soil broke up quite loose

and friable and most of the pupæ were thus brought up to the surface and mixed up with loose earth and remained unmolested, and in a good state of preservation. This work, as a means of control, was again on the point of being abandoned when it was noticed that crows were feeding upon the pupæ and were giving no signs of discomfort or sickness like that which had killed the turkeys the summer before. The man driving the plow related that the first morning not long after he had started plowing, he had noticed a crow alight in the vineyard and it followed along in the furrow, pecking away to the right and left. After a while it flew away, but not long afterwards several crows returned, remained a while busily engaged in hunting around in the furrows, and again all departed. This action of the birds awakened the curiosity of the man, who observed that the crows were eating the pupæ, even picking out of the ground those which the plow had only partly uncovered. By nightfall over one hundred crows were in the vineyard and the following days many visited the vineyard until the plowing was finished.

The crows made a thorough clean-up of the pupæ and the following July, when the succeeding infestation was expected, it was difficult to find a worm in the vineyard.

When, after several days, the crows had been coming regularly to the vineyard and none were showing any signs of discomfort or sickness, closer observation disclosed that instead of swallowing the pupæ as had done the turkeys the year before, the crows cracked them, consuming the contents, but rejecting the hard chitinous shell. Thus, in this case, the control was a natural and very efficient one performed by uncommon predators. This insect in the larval state seems to offer no attraction to birds of insect eating habits.

There is a third outbreak on record reported by Prof. H. J. Quayle[1] in the vineyards of the California Wine Association near Reedley, Fresno County, California, in 1907. Seventy-five acres of vines were completely stripped of their foliage. Hand picking was resorted to and a gang of two hundred men was employed for this purpose. The worms were carried away by the cartloads and burned.

These three cases were discovered only when the defoliation of the vines had become so conspicuous as to attract attention. It was different with the outbreak on the Martin ranch at Rayo, Tulare County, one by far the most serious on record as occurring in California, which, in conjunction with the subsequent control, are the main subjects which prompted the writing of this article.

The outbreaks in San Joaquin County, near Escalon, though of a serious nature and of no mean proportions, would probably have been succeeded by a second one the following year had it not been for the control as already related. The outbreak in Kings County, not far from Goshen, reappeared the following year but very much reduced in intensity, the nature of which may be assumed from the fact that hand-picking of the worms by five persons materially reduced the infestation over an area of at least ten acres. The previous year parasitism of the larvæ was quite in evidence with specimens collected. It probably

[1]Insects Injurious to the Vine in California. Bull. No. 192, Univ. Cal. Col. Agr.

accounts for this year's light infestation and is a reasonable explanation for the decrease in severity.

On the Martin ranch the initial and subsequent infestation progressed differently. The first in 1918 served as a center for a very much magnified outbreak the following year. The first year the outbreak lacked nothing in severity to that of 1919, but it differed as to the small area to which it remained restricted, which comprised ten to fifteen acres of Thompson's Seedless so badly attacked that the majority of the vines were completely defoliated and the crop of that many acres destroyed; and, although it was only a crop of comparatively small acreage, at the prevailing prices of grapes that year, it proved to be a considerable loss to the renters, who, as most always in such cases, had had no warning of this disaster until the vines were defoliated, and thereafter, according to their statement, the worms disappeared within a few days time.

FIG. 150.—The Achemon sphinx moth (*Pholus achemon*). Adult male moth at rest; about four-fifths natural size. (U. S. Dept. of Agriculture.) Original.

This sudden appearance, and no less rapid departure of the worms, leaving in their wake so severe an attack upon the vines, impressed them as being a disastrous scourge. The following year, 1919, they were on the alert for a recurrence of the pest and were so keen in detecting its presence that long before the date of last year's outbreak, which occurred the last of July, this year as early as the twentieth of May they found a few very recently hatched worms and also discovered eggs in large quantities on the same acreage of the previous year. They immediately notified the owner of the ranch, Mr. J. D. Martin, who lost no time in taking steps to ward off the threatened loss of a crop for a second time. In this way the writer became acquainted with the situation and undertook to combat the pest and with the owner made a survey of existing conditions. It was found that from the small infested area of the preceding year as a center the new outbreak radiated to the far limits of the neighboring tracts of vines on the same

ranch. The presence of the moth in the form of eggs, a great many of which were on the point of hatching, also worms recently hatched and some partly grown, could be detected over an area of 700 acres, 160 acres of which was very badly infested, another 160 less so, and on the remaining 380 acres the vines were more or less infested, the majority harboring several worms, many one or more, and a few vines here and there, on vineyard plots farthest removed from the center of infestation, showed little or no signs of having any. However, as the detection of a very few worms about of the same color as the leaves of a vine having much brush and foliage, requires very close scrutiny, in order to take no chances of overlooking any part of the vineyard more or less infested, which might be a likely means of causing another outbreak a third year, the 700 acres were sprayed. This left 200 acres of one- and two-year-old vines on the total vineyard area unsprayed, although here and there throughout this acreage a small vine could be found with a worm, or conspicuous because having not a leaf left on it. There were, however, too few worms scattered far and wide, to be a menace.

Such an outbreak as this offered exceptionally good material for precise data on the biology of this moth and the writer had planned to carry on laboratory experiments simultaneously with the field control work, but from the very first it was found impossible to do this. The work in the field which had to be done so rapidly in order to cover such an extensive area required a constant supervision and little or nothing else could be attended to with a semblance of continuity. When this work was about finished and more spare time available the worms which had been so exceedingly numerous were no longer obtainable in sufficient quantities, at different stages of growth or in healthy condition. No portion of vineyard which needed it had been left unsprayed.

BIOLOGICAL NOTES.

Notes of the writer at this time on the Achemon grape sphinx moth are too incomplete to claim recognition as a study of the biology of this insect. They are, nevertheless, interesting and worth stating as a contribution to that end. Having no assistant to help out with the scientific phase while the control work was being performed, little or no time could be spared from superintending the application of the spray for biological observations. The notes recorded here are those obtained from a few belated specimens collected later from the vineyard in Kern County already referred to in some other part of this article.

THE EGG.

Data are lacking on the number of eggs oviposited and period of incubation.

The egg is small, 1½ millimeter in diameter, spherical in shape, the surface smooth, devoid of any markings even when seen under a high magnification as shown in figure 151, of a green color very much the same as that of the leaf upon which it is deposited. A very close

scrutiny would be required to distinguish it from the leaf were it not for the reflected light due to its spherical form which attracts attention.

FIG. 151.—Egg of Achemon sphinx moth. The inclosed larvæ may be seen through the translucent eggshell. Magnified 5 diameters. (U. S. Dept. of Agriculture.) Original.

As the embryo develops and becomes more discernible through the shell, the egg becomes opaque and lighter in color, and just prior to hatching is almost white due to the color of the young worm within it. The egg, figure 151, had reached this stage when photographed.

The eggs are deposited singly on the upper surface of fully developed leaves, never on tender growing leaves, consequently on the foliage of the main part of the vine and not on leaves at the end of herbaceous shoots.

The specimens which served for this study, when collected, had been oviposited a few days before; the embryos partly developed within were discernible and these eggs could consequently furnish no records of incubation. On the other hand, female moths caught in flight and confined in cages gave very unsatisfactory data in respect to oviposition. Of six individuals, two deposited one egg apiece, and no eggs were obtained from the other four. The larvæ that hatched from the eggs died. Because of the flying and feeding habits, some difficulty may be encountered in obtaining reliable data on oviposition and the period of incubation when rearing the moth in cages. Being a consistent and rapid flyer, known to cover long distances to find food, confinement may be an obstacle to the production of normal healthy eggs.

In hatching, the eggshell is often broken into unequal parts, that portion adhering to the leaf remaining attached to it. At times a rift only in the shell permits the young larva to extricate itself from the interior and in this case the whole empty shell remains fast to the leaf. The shell is pearly white with an opalescent sheen.

THE LARVA.

General Characteristics.

At this stage of the insect's life cycle, the larva is usually referred to as a worm rather than a caterpillar.

The names "hawk moth" and "sphinx moth" are commonly used to designate moths of this family (*Sphingidæ*). The worms in general are

characterized by having an appendage horn-like in shape, more or less long and prominent according to species, situated dorsally on the anal segment. The horn of the achemon species disappears before the worm is fully grown. This feature, when some worms seemingly of the same size and age have a horn and others have none, and the fact that the worms are either of one of two general colors, some being green and others of a reddish shade, changing from pink when small to a red brick, and later to a light purplish red or even lavender as the worm grows in size, is somewhat puzzling when they are seen in numbers on a vine.

TABLE I. Record of five individuals of the Achemon sphinx moth (*Pholus achemon*) from egg to adult.

Eggs	Date collected	Date hatched	Date 1st molt	Period 1st instar	Date 2d molt	Period 2d instar	Date of signs of prepupation	Date of 3d molt pupation
	1919	1919	1919	Days	1919	Days	1919	1919
No. 1	6/10	6/16	6/24	8	7/ 3	9	7/10	7/14
No. 2	6/10	6/16	6/23	7	6/30	7	7/10	7/14
No. 3	6/10	6/17	6/24	7	6/30	6	7/ 9	7/15
No. 4	6/10	6/17	6/24	7	7/ 1	7	7/10	7/15
No. 5	6/16	6/18	6/27	9	7/ 4	7	7/12	7/21
Average				7.6		7.2		

Eggs	3d instar period, larva grows	3d instar period of prepupation	Period of 3d instar	Date of emergence of moth	Period of pupation	Sex	Color	
							Green	Red
	Days	Days	Days	1919	Days		Instars	Instars
No. 1	7	4	11	8/ 7	24	Male	1st	2d and 3d
No. 2	11	4	15	8/11	28	Male	1st	2d and 3d
No 3	10	6	16	8/ 6	22	Male	1st	2d and 3d
No. 4	9	5	14	8/ 6	22	Male	1st	2d and 3d
No. 5	8	9	17	8/18	28	Female	1st, 2d and 3d	
Average	9	5.6	14.6		24.8			

The larval stage comprises three instars. Table I furnishes a record of five individuals which gives an indication of an average period of days for each instar as also of the prepupal and pupal periods for worms of moths which have emerged the same year. The first instar lasts an average of 7.6 days. The second instar an average of 7.2 days; the third instar up to the time of prepupation an average of 9 days, and an average of 14.6 days for the complete instar, when occurs the third molt and change to pupa. There elapses an average of 24 days from hatching of the egg until the worm enters the ground; in other words, when prepupation begins, an average of 30 days from the day the worm hatches until it pupates, and an average of 54 days from the day it hatches until the moth emerges. Just how early the moth emerges the next spring is uncertain as there seems to be no definite records on this point.

During each instar the growth of the worm proceeds in a regular and distinctive manner while feeding on leaves of the vine. At first (the beginning of an instar) the head is larger in size than the body. Fig. 152 and Fig. 153 at right. It is disproportionately so when compared to the shape of the full grown worm; but the body, comprising all segments and parts, rapidly grows while the head seemingly remains the same, and soon head and body are for a short while of such proportions as to impart to the worm a cylindrical even form from one extremity to the other, then the body continues to gain in proportion until, in turn, the

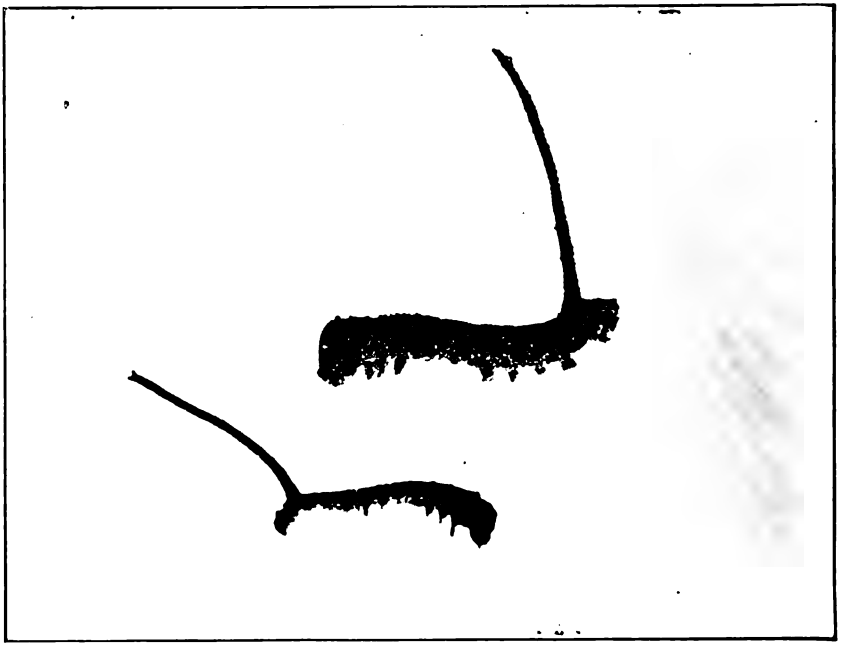

FIG. 152.—Larvæ of the Achemon sphinx moth: Above, larva about 3 days old; below, larva newly hatched. Magnified 4 diameters. (U. S. Dept. of Agriculture.) Original.

head becomes very small in comparison. The head has, nevertheless, also increased some during this period.

Towards the end of both the first and second instars, the worm assumes a peculiar form and posture which invariably denotes that the act of molting is soon to follow. The body is fully extended, having the appearance of being bloated. The three pairs of legs of the thoracic segments release their hold of petiole, or stem; the head is extended downward while the first five segments are slightly raised. The worm has lost all activity, even teasing will not awaken it from the torpid state it is in and which lasts during the time molting takes place and even continues several hours longer.

Fig. 153 is a photograph of the same worm just previous to molting (second molt) and immediately afterwards. It will be noticed that the head of the worm before and after molting is very conspicuous in regards to the difference in size.

FIG. 153.—Larvæ of the Achemon sphinx moth; four-fifths natural size: Above, after second molt; below just before second molt. The larva has no horn after second molt. (U. S. Dept. of Agriculture.) Original.

Molting.

The casting off of the skin or "exuvia" during the act of molting is slow and laborious. The first indication of this change is evidenced by a whitish dull color which the head of the worm takes on. This is due

of setae are more or less in evidence according to the shade and color of the worm. Both worms of figure 153 give a very fair idea of the markings and small tubercules at various periods.

During the third instar, the worm whether of one or of the other color, red or green, grows rapidly to an uncommon size. It is during this period that it assumes the form and deportment, when it is more noticed

FIG. 155.—Larvæ of the Achemon sphinx moth: At left, full grown, natural size. At right, same worm enlarged. (U. S. Dept. of Agriculture.) Original.

and better known. Therefore, it will not be amiss to more fully describe it at this stage of its life.

The body is cylindrical, smooth, the segments of the body slightly wrinkled transversally, tubercules devoid of setae are regularly distributed in transverse pattern all over the worm, more sparsely so on the three thoracic segments than on the others. The thoracic segments and

head are retractible. When in repose this portion of the worm is withdrawn in such a way as to encompass the three pairs of legs and head within folds thus made. Figure 155 gives different views of the same worm. At left, worm life size with leaf cut back to a stub for better focusing of picture; at right, the same enlarged for more detail and stub of leaf cut away.

When active, in feeding or crawling, the worm stretches out and becomes fusiform. In this posture some individuals when full grown measure as much as three and one-half inches long and even a trifle more. The worm is very slow in moving about. In its action of locomotion it undulates the body first to one side and then to the other as the prolegs are being moved forward, giving the impression of having some difficulty in detaching them from the support along which it is traveling.

The prolegs, especially the anal pair, possess the ability of clasping with considerable strength. When the worm for some reason is forced to relinquish its hold of a vine cane, petiole of leaf or other part of the vine, it can hang by the anal prolegs and thus sustain its whole weight until a new hold can be regained. The prolegs are provided at their extremities with a fan-shaped appendage, covered with cilia-like minute hooks, which enable the worm to hold fast in any position. The worms are seen either actively feeding or motionless, reposing only to digest the food with which they gorge themselves while feeding. The worm having finally attained its full growth, ceases feeding all at once. It becomes very sluggish and recovers its activity no more. In a semi-lethargic state it seeks the ground in which to pupate. By successive attempts it makes its way down the vine. Sometimes it just drops to it. The worm then keeps moving lazily over the surface of the soil until it finds the shelter of a clod or a depression which offers some advantage of concealment at first and later for burrowing-in. Thus protected the worm begins to shrink in size and taper down at both extremities and then it wriggles its way into the soil. Once buried, the metamorphosis proceeds rapidly; the proleg shrinks away and in its stead is left a cup-like depression.

At center of figure 156 is shown a prepupa arrested in the act of transformation by reason of some disease, presumably a wilt or some bacterial disease. The cup-like depressions are noticeable.

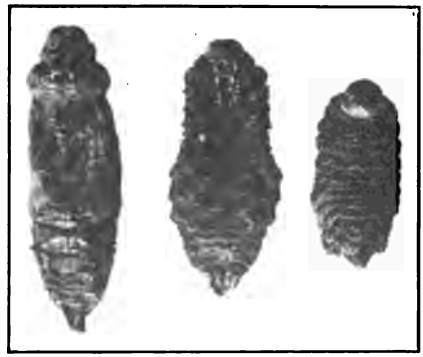

FIG. 156.—Prepupal stages of Achemon sphinx moth arrested during metamorphosis: At left, by parasitism; at center and right by disease; about four-fifths natural size. (U. S. Dept. of Agriculture.) Original.

THE PREPUPA.

The prepupa stage takes place during the latter part of the third instar. The gradual change in form from larva to pupa, concurring

with a general shrinking of the worm lasts on an average from 5 to 6 days and can be followed step by step by the investigator in the evolution of form of the insect during the metamorphosis which terminates with a molt, the third and last one of the larva. The skin is ripped asunder along the dorsum of the prepupa. A rapid wriggling motion casts off the exuvia and the pupa is thus revealed.

THE PUPA.

After molting, the pupa remains soft for several hours. Fig. 157 at left. As the chitinous surface dries, the contours of the body segments become less pronounced and the pupa acquires a tough smooth surface. The whole upper portion, comprising the head, thorax, antennæ, proboscis and wing pads, is green immediately after the exuvia is cast off, changing to yellow within a few hours time, and is finally a dark mahogany red, while bands of a similar red appear on the body segments, which at first are green, changing to red as the bands continue to spread over the whole surface. When three or four days old the pupa is of a uniform mahogany red color which continues the same when the cuticle has become a toughened chitinous shell, impervious to moisture and a protection against climatic influence. In this form the pupa remains in the soil with no protective earthen cocoon. The proboscis is sealed in its entire length to the venter, distinguishable only in outline from the antennæ and vein markings of the wing pads. The pupa is about 2 inches long.

FIG. 157.—Pupæ of the Achemon sphinx moth. At left, just after casting the prepupal skin. The pupa is still soft. At right, pupa 4 days old; about four-fifths natural size; the color has changed from green and yellow to a reddish brown. (U. S. Dept. of Agriculture.) Original.

THE MOTH.

The moth, or adult, is beautifully colored. (Female, figure 146; male, figure 150). The general coloring of the forewings, body, thorax and head is of a soft, velvety light-fawn brown with darker macular shading and darker markings. On the thorax are two triangular-shaped spots of a deep maroon-red; a rectangular one of the same color on the lower margin of the forewing and one of irregular pattern of a browner tint of maroon-red towards the tip of the same margin. One apical spot and another not far from it are both of a maroon-red coloring merging into the general fawn-brown background. With some individuals these last two spots are merely a rich seal-brown lacking a dark red cast. The hind wing is a deep rose with darker shadings. A seal-brown band the entire length of the lower margin is separated from the rose-colored portion of the wing by a narrow penciled band of a darker hue, partly

magenta-brown and partly dark brown, as it extends towards the tip of the wing.

The moth is a crespuscular species, one which flies at the dusk of the evening. Its wings are powerful; its flight swift; the moth remains poised in the air rapidly vibrating its wings while it feeds by projecting its long tongue into the calyx of flowers of garden plants. It seems to have a preference for petunias. It darts from blossom to blossom much like a hummingbird, and in the twilight is often mistaken for one.

It is probably due to its habit of flight that the moth oviposits one egg only, rarely two, on the same spot of a leaf and always on the upper surface. These leaves are part of the exposed foliage of the vine. Very seldom on leaves overshadowed by others. Eggs are most frequently deposited on the east side of the vines, less often on the south side and are scarcer on the north and west, fewer in number in the order named.

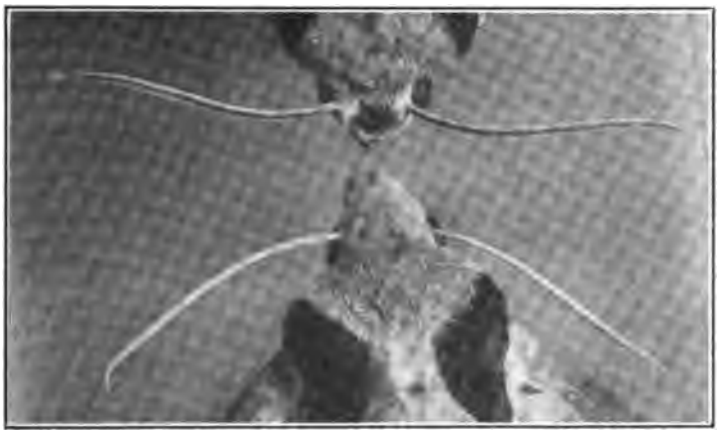

FIG. 158.—The Achemon sphinx moth. Antennæ of male (above) and female (below). Enlarged. (U. S. Dept. of Agriculture.) Original. The dark spot on clypeus of male is due to scales being rubbed off. It should be covered with scales like that of the female.

The male moth in color and pattern of wings differs but very little from the female moth. In general, the males may be said to be of a slightly darker shade of brown. The color of the hind wings of both sexes is very similar. The male is somewhat smaller in size than the female. The sexes are more easily recognizable by the antennæ, although close attention is required. That of the female is filiform, has rather a smooth surface and is almost white. That of the male is serratulate, not so light in color but not even a light gray. Fig. 158 male, above; female, below. The aspect of the small serrations, or small saw-like teeth, may be responsible for the darker shading. The differentiation of color of the worms seems to have a bearing upon the sex of the moths. Worms of the third instar when green produce female moths and when red produce males. The worms kept under observation and from which data in this respect was obtained were too few in numbers to draw definite conclusions and to offer a theory of prognostication; we

wish only to indicate a possibility in this respect which requires a substantiation of facts based upon observations which should include a much greater number of individuals of both colors.

Table I indicates:

Four red worms producing four males;
One green worm producing one female.

On the other hand, field collection of worms of the third instar furnished the following data:

Thirty-six green worms collected entered the ground to pupate 4 to 6 days later, and after 28 to 30 days five female moths emerged. Under similar circumstances two red worms placed separately each in a cage produced two male moths. Hence, to summarize:

Six red worms gave six male moths;
Six green worms gave six female moths.

This data, though possessing some grounds for formulating this theory, may, after all, be only the result of coincidence.

At rest, Fig. 150. The wings of the moth do not overlap. They remain in an A-shaped form and horizontal.

LIFE HISTORY.

Under California conditions the life history of this species of moth is somewhat perplexing. There exists no records whereby it is proven that two full broods actually occurred the same year. Upon each occasion when the outbreaks mentioned were investigated, a few larvæ were collected and kept under observation, and every time some moths emerged the same year. In 1914 the worms pupated the first days of August. A few moths emerged a month or so later, but by far the greater number emerged the following spring about the latter part of April. A fair percentage of these pupæ were parasitized, or died of disease. This emergence was earlier than any recorded in the field but may be due to abnormal conditions pertaining to the insectary. In 1918 only a few specimens which were obtained from the Kings County vineyard also pupated in August. A few moths emerged the same year, the remaining pupæ were either parasitized or diseased and none emerged the following spring although an infestation occurred again that spring in the same vineyard where the specimens had been collected. It was, however, lighter than the one of the previous year; in short, no brood of any consequence has been observed a second time the same year of the outbreaks.

In view of the fact that such serious outbreaks occur from time to time in vineyards where worms have not been previously found the following theory might be advanced as an explanation. A few moths emerge very early in the year from overwintering pupæ. For some reason or another, they are attracted to the same vineyard, oviposition occurs within a restricted area. The worms that issue from these eggs would probably be more or less widely distributed. Probably three or four, or even less to a vine scattered here and there. The larval stage could pass without being detected. Under such conditions parasitism and disease would likely not be prevalent, consequently most all the

pupæ would become moths, and making allowances for the percentage of males, there could be left enough females for their eggs to have increased in a very high ratio over the number of eggs of the moths from the overwintering pupæ. The presence of the worms of this second brood, constituting the outbreak, would, as is generally the case, attract attention only when the vines were stripped of the leaves, and as this would take place during the few days of the third instar, a severe infestation would naturally have a sporadic aspect.

This theory is wholly speculative and is offered only for the purpose of trying to co-ordinate data at hand, which, though accurate, is insufficient and in some respects not corroborative. Within the limit of facts as far as known, there would be but one real brood per year, followed the same year by a partial second one and perhaps also preceded by another partial one, the pupæ of which had overwintered. In this case, worms of the outbreak would be of the second brood of the year and not of the first brood. Parasitism and disease after all may be paramount factors in the life history of this insect under conditions which exist in California.

PARASITE AND DISEASE.

Many of the worms die of disease before pupating. The critical period is during prepupation. The worms grow normally up to that time without showing signs of being affected. Prepupation begins, but instead of the metamorphosis taking its course, the worm shrivels up into a wrinkled dried-up form by reason of the disease. At right, Fig. 156, shows a prepupa that dried. At left, a prepupa parasitized. At center, one when the disease is first apparent and indicating that metamorphosis has ceased.

A tachinid fly *Sturmia distincta* Wied[1] (Fig. 159) is a very common parasite of the worm. The egg is deposited upon, and without preference for any part of the worm. When it hatches, the larva, or grub, of the parasite burrows its way in, selecting a tubercule for that purpose. Evidence of this is easily noticeable on the green worms, much more so than on the red ones. A discoloration of the worm's skin appears at the point of puncture and later it is a small dark spot; the empty eggshell can often be found adhering to it. The worm is host for a number of grubs of a same species that become adult flies after the worm has pupated. Fig. 160 at right shows the emergence holes of a number of flies from one pupa.

FIG. 159.—*Sturmia distincta* Wied. A tachinid parasite of the larva of the Achemon sphinx moth. Magnified about 4 diameters. (U. S. Dept. of Agriculture.) Original.

[1]Determined by W. R. Walton, Bureau of Entomology, U. S. Dept. of Agriculture.

FIG. 160.—Emergence holes of tachinid flies from parasitized pupæ of the Achemon sphinx moth. At right a whole pupa, about four-fifths natural size. (U. S. Dept. of Agriculture.) Original.

INJURY.

The Achemon sphinx moth becomes at times a pest of considerable economic importance from a commercial point of view because of serious crop losses, but as a pest of plant life it causes but little damage, the injury to the vine itself being of short duration and rapidly outgrown. The greatest injury committed is a complete defoliation of the vine by the worms skeletonizing the leaves. (Fig. 161.) The parenchyma, or surface of the leaf, alone is eaten. When there is no longer this kind of food, the worm takes to eating the berries in preference to the ribs, veins, or petioles of the leaves. The green stems are never attacked. The defoliated vine puts forth a rapid rejuvenating growth of leaves within a week or ten days time if the vineyard is in good condition of cultivation, and this new foliage can be hastened in its development by irrigation.

The sudden arrest in the vegetative functions of the plant caused by defoliation reacts upon the development of the fruit; if in an early stage of growth, when the berries are yet small and quite green, these will shrivel and more often drop from the stems, the consequence being a total loss of crop. If the fruit has reached a point where the berries have begun to ripen, these being deprived of the functions of the leaves, the maturing progress of the grapes is arrested until the advent of a new growth of leaves which continue once more the transformation of the sap for the benefit of the fruit. The berries, in the meantime, have softened some; they are not so firm in texture as a normal ripening would produce, and although they continue to acquire sugar they do not attain so perfect a state of maturity.

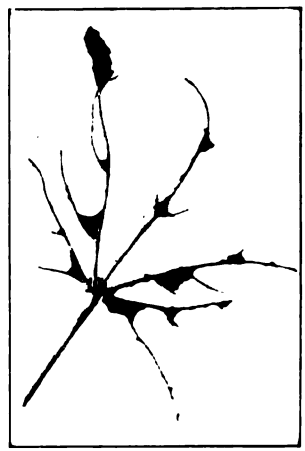

FIG. 161.—Characteristic injury by larvæ of Achemon sphinx moth. one-third natural size. (U. S. Dept. of Agriculture.) Original.

Upon hatching, and once freed from the eggshell and dried, the young larva manifests its proclivity for eating by beginning to feed right on the spot where the egg was deposited and where, ordinarily, a part of the eggshell continues to remain attached. Eggs are deposited on old leaves. The gelatinous secretion produced by the moth while oviposting and which glues the egg to the surface of the leaf probably facilitates the gnawing of the young worm at this point. A round hole about 4 millimeters in diameter is eaten through the surface, after which the larva repairs to the underside of the leaf. When feeding is resumed the

margin of the leaf is attacked and the worm eats the parenchyma edgewise, consuming it between ribs and veins, skeletonizing the leaf. Fig. 161. This small round hole is peculiar because it is the only time the worm eats in this manner. It is a conspicuous hole in the leaf and betrays the presence of the pest in the very early stages of an infestation when otherwise it would pass unnoticed, by reason of the egg being the same color as that of the leaf, and the young worm also green is screened from view on the underside of the latter.

The worm is a voracious eater at any time of its growth, but it increases in size more during the third instar and consumes from six to seven times more food during that period than during the first two instars together. Worms, after molting the second time, placed in cages enclosing shoots of vines have eaten from eleven to fifteen leaves, representing a surface of from 190 to 255 square inches. The defoliated vines shown in figure 147 comprise about two acres of the Martin vineyard which were some of the worst infested but which could not be sprayed until the last because having been recently irrigated the ground was too soft to drive over with a power sprayer. From one of these vines by actual count 252 worms were picked off by hand, the worms ranging in size from a few recently hatched larvæ to some almost full grown and on the point of pupating.

It is therefore not astonishing that the worms so often escape detection until the vines are defoliated if only one considers the quantity of food consumed in the short space of time during which they complete their growth (period of 3d instar) and the great number of worms that are on the same vine.

CONTROL.

As a control for the Achemon sphinx moth the only one that can at this time be recommended by the writer is one which was carried out in the work performed for that purpose on the Martin vineyard at Rayo, Tulare County, last May-June (1919).

As previously stated, the object in undertaking the control work was primarily to save a valuable crop of grapes; therefore, the economic phase of the work superseded in importance the scientific, consequently results to be obtained must be, perforce, practical rather than experimental. Had the intention been to determine with precision factors contributing to a control spray, a number of spray formulæ would have been tried out, each one made up with varying proportions of the composing elements. This method of procedure would have demonstrated the lowest cost of the spray for an equal efficiency. But actual conditions precluded taking chances, and the spray formula that gave such good results from the start was the one to adopt, even if more costly than another which time and experimentation would have proved equally as good.

No sooner had a survey been made of the infested vineyard than it was a foregone conclusion that time was the essential factor of success. The worms would be more susceptible to the effects of the spraying if only partly grown, and the spray must be applied no later than a few days' time before the worms about full grown dropped to the ground to pupate, so that they would have some time to feed upon leaves sprayed with the poison. The method adopted consisted in spraying

with a mixture of ingredients to produce the double effect of a contact insecticide and a poisoning one. The poison agent being arsenate of lead in the form of either paste or dried powder, to which was added atomic sulphur (sulphur in paste form) to increase the poison efficiency, as it is by itself somewhat of a stomach poison for insects. This mixture had also the advantage of spreading the arsenate of lead, in smaller quantities, it is true, but more evenly distributed over a much greater surface, coating the leaves more thoroughly and thereby being more available to be consumed by the worms.

The sulphur in this form is also an active fungicide. The tender, rapidly growing leaves and young shoots, especially those put forth by a vine following partial or total defoliation, are an excellent medium for mildew. The atomic sulphur was used mainly for the purpose of keeping this thrifty, delicate new growth of leaves vigorous and healthy by being free of mildew, giving the vine in this way a chance to recuperate as rapidly as possible from the injury it had sustained from the action of the pest.

Ground glue was another ingredient used also as a spreader, but more particularly to render the solid contents of the spray material, such as the arsenate of lead and the atomic sulphur, more adhesive. This property was very forcefully demonstrated when the vines were rained upon during most of one afternoon and the night of the same day. Vines which had been sprayed but a short time before the rain, had much of the arsenate of lead and sulphur washed off and had to be sprayed over; but those which had had time for the spray to thoroughly dry previous to the shower, showed little or no signs of having lost any.

"Black-leaf 40," a concentrated tobacco product containing nicotine, was added to act as a killing agent by contact. The doses used were somewhat stronger than it is generally recommended to be effective, but it was a question of doing this work rapidly, thoroughly and taking no chances of even a partial failure; the result meant too much.

Figures very often give a more comprehensive idea of the magnitude of an undertaking and indicate reasons why certain methods are preferred in accomplishing a task.

Variety of Grapes and Acreage Sprayed.

Thompson's Seedless	360 acres
Malaga	70 acres
Emperor	35 acres
Muscat	225 acres
	690 acres

Formula of Spray.

Arsenate of lead (paste)	11 pounds
Atomic sulphur	24 pounds
Ground glue	1 pound
"Black-leaf 40"	1½ pints
Water	200 gallons

Quantity of Material Used and Cost of Same.

Arsenate of lead (paste and dry powder), 9,600 pounds	$1,553 50
Atomic sulphur, 19,900 pounds	1,767 25
Ground glue, 598 pounds	167 44
"Black-leaf 40" (143 gallons), 1,430 pounds	1,537 25
	$5,025 44

FIG. 162.—Showing results obtained on full grown larvæ in the control work performed on the Martin vineyard. (U. S. Dept. of Agriculture.) Original.

The spray was applied with spray guns, two to each outfit. They were found to be far superior for this work to the old-time spray nozzles which were used the first day and then discarded. With the spray guns the application was not only more thorough, but was accomplished much faster. Spraying kept pace with a team walking slowly. One side of a row of vines was sprayed by a man of one outfit, and the opposite side sprayed by one of another outfit. (Fig. 148.) In this manner much time was saved by not stopping the team to allow a man to walk around a vine to finish spraying it.

At one time eight outfits were employed on the job, beginning with three and adding more as fast as they could be obtained. Four of these were shipped in lots of two by auto truck from the factory in San Jose to the ranch in Tulare County, a distance of about 200 miles as the crow flies. A mechanic was employed to keep the outfits in perfect running order. Field stations were set up at convenient places on the irrigating ditches and within close proximity of the vineyard plots sprayed, to avoid returning to headquarters for replenishing the spray tanks. (Fig. 149.)

From start to finish, considering the few machines used at the beginning, an average of five outfits was kept steadily busy. Spraying was begun May 23 and ended June 9, the teams resting the second Sunday, lasting, therefore, 17 days, during which time 165,000 gallons of spray material were used. The outfits put out from nine to twelve tanks per day.

The cost of the spray rigs and labor, added to that of the material, amounted in round figures to $11,000. Compared to the value of the crop from the acreage sprayed, estimated by the owner to be close to $300,000, the control work cost less than 4 per cent of the net returns.

EFFICIENCY OF THE SPRAY MATERIAL.

Worms of the first and second instars were very susceptible to the spray by contact. No sooner was a vine sprayed than many of the worms of the first instar size would drop from the vine and never move from the spot where they fell. About twenty-four hours later worms of a larger size, that of the second instar, would likewise be found on the ground, dead or in a dying state, and forty-eight hours later all worms found on the vines were either sick or dying. (Fig. 145.)

That young larvæ should succumb to the effects of "black-leaf 40" is not surprising, but that others, as large as half-grown and more, should be affected in a like manner must be ascribed to the combined effect of black-leaf and the other ingredients. The combination of arsenate of lead, atomic sulphur and glue produces a good adhesive coating which provokes a longer contact of the "black-leaf 40" with the worm and causes death, when otherwise the nicotine, volatilizing more rapidly, would not do so. The majority of the half-grown worms do not give evidence of the spray acting upon them in the same way as it does on older worms. These die from the effect of poisoning; feeding upon sprayed leaves for twenty-four hours and less makes them sick. They linger on the vine and finally die. Many fall to the ground, while others remain suspended from stem or cane. (Fig. 162.)

THE DRAMATIC CAREERS OF TWO PLANTSMEN.[1]

By DAVID FAIRCHILD,[2] Washington, D. C.

Plantsmen are born, and are seldom or never made by education. A man may be a good botanist and not be a good plantsman, for a botanist's interests lie in the names of the plants, or their morphology or anatomy or cytology, or in their chemical constitution. He may be an expert botanist and yet, in the country, surrounded by trees and fields of wild plants, be unable to tell one species from another. A plantsman, on the other hand, loves plants for their own sake, and, as he wanders through life, forms the habit of knowing the trees and shrubs and weeds growing about him and is not satisfied if he can not identify at least the families to which they belong. This love goes deeper still if he is a true plantsman. It makes him unhappy if he is not growing plants himself and watching them develop.

The careers of two of the world's true plantsmen have just closed, and in such dramatic fashion that the cable dispatches regarding their deaths have been published throughout America: Frank N. Meyer, of Amsterdam, Holland, and Aaron Aaronsohn, of Haifa, Palenstine—the one while descending the Yangtze River, the other in a fall in an airplane off the north coast of France.

By that strange attraction which brings congenial people together, Frank N. Meyer, for years the assistant to Hugo de Vries in Amsterdam, drifted into the organization of the Office of Foreign Seed and Plant Introduction, became an American citizen and an agricultural explorer, and Aaron Aaronsohn, Director of the first American agricultural experiment station on the shores of the Mediterranean, became a foreign collaborator of the same office.

Through these coincidences I came to know intimately those two remarkable men, whose work in the discovery of new plants for the use of plant breeders has already become history.

For nine years Frank Meyer wandered on foot along the narrow pathways of China, gathering the plants which he believed would grow in America. As I write of him here, his hardy yellow rose, *Rosa xanthina*, peers in upon me through my study window, and up in the border his scarlet lily is in bud, while the perfume of his lilac has barely passed away. His white-barked pine is dusting its pollen into the air, his Euonymous and his hardy bamboo are growing at the corners of the house, and his dry-land elm with its delicate branches shades the entrance. So much of China has he successfully transplanted to this country.

Meyer's memory of the forms of plants as they appeared in the open was remarkable. In this lay his great power. He could keep in his mind the characters of thousands of plants—many of which he had only once seen—and this enabled him to recognize at once any which were strangers to his experience. It is this form memory, inborn certainty, but trained by years of solitude in forests and by long tramps through the fields looking for flowers, that proves such an invaluable asset in the profession of an agricultural explorer. This, combined with the enthusiasm of a boy to whom everything is new, made Meyer unique as a hunter of plants.

[1] From "Journal of Heredity," June, 1919.

[2] Agricultural Explorer, in charge Office of Foreign Seed and Plant Introduction, U. S. Department of Agriculture.

FRANK N. MEYER, AGRICULTURAL EXPLORER.

FIG. 163.—The plant explorer's reward comes from seeing the fruits and flowers which he has gathered in remote corners of the earth growing successfully in his own country. Fortunately, Frank N. Meyer lived to see many of his own introductions established in the United States. The one which he is here examining in the Plant Introduction Station at Chico, California, is a walnut which he sent from northern China.

The plant breeders of America and of all countries where the problems are similar will benefit by Meyer's explorations in many ways, for he had the tastes of a plant breeder and expected, when his traveling was done, to settle down in a plant-breeding garden somewhere in the Rocky Mountain region, where a high altitude and cool weather would enable him to carry on breeding work throughout the summer. His notes, published in the "Inventories of Seeds and Plants Imported," of the Office of Foreign Seed and Plant Introduction, are full of suggestions to plant breeders, and, luckily, his suggestions are backed up by living material which will make it easy to provide the breeders with many of the plants which he describes.

Meyer collected a very wide range of plants. He collected wild alfalfas in the Caucasus, Chinese Turkestan and Siberia; sorghums and Chinese pears in Manchuria; wild peaches and almonds in the Kansu province; chestnuts east of Pekin; persimmons in the Ming Tombs Valley; wild conifers in the Wu Tai Shan; citrus fruits on the Upper Yangtze; bamboos and strawberry trees (the Yang mae) south of Shanghai; jujubes and the pound peach in the Shantung province; dwarf almonds, dwarf cherries and apricots and large fruited oleasters in Russian Turkestan; desert poplars and tamarisks, wheats and barleys in the desert region of Chinese Turkestan; wild apples and apricots in the Tisu Shan range which divides Siberia and Chinese Turkestan; large fruited black currants from the Yakutsk province of Siberia.

I doubt if any man has traveled more miles on foot than Meyer did, in search of his plants. He was attacked by ruffians in Harbin; his life was threatened by Chinese soldiers in Kansu, who stood him up against the wall. He spent months in the uncomfortable inns and was quartered in temples and other strange places in China. He ran the gauntlet of suspicious Russian officials on the border between Siberia and China at a time when the relations between these two countries were strained. He had the distinction of having his photographs of deforestation in China used by President Roosevelt in his message to Congress. Shut in by the Chinese revolution in Ichang for many months, his health, which had begun to feel the effects of lonely travel, broke down and, when finally he succeeded in escaping, the strain appears to have been too much. He disappeared from the river steamer in the middle of the night of June 2, 1918, and his body was found several days later by the American consul at the little town of Wuhu, where the Chinese, who had found it in the river, had temporarily buried it, and from which place it was taken to Shanghai, where it now rests.

Aaron Aaronsohn began his life on horseback, so to speak. On his Arab steed he traversed the Jordan and climbed the slopes of Mount Hermon in the Holy Land. Educated as a protege of Baron Rothschild, in Grignon, France, and as a friend of the African explorer Schweinfurth in Berlin, he early became interested in the wild plants of Palestine and made collections of the wild forms. Urged on by his professors in Bonn and Munich to discover the origin of the cultivated wheat plant, he found on the slopes of Mount Hermon a truly wild wheat, which has been subsequently named by O. F. Cook in honor of the discovery, *Triticum hermoni*. Because of the fact that certain crosses of cultivated wheats revert to it in character, and from the fact of its undoubted wild character, it appears in all probability to be one

FIG. 165.—The Abbott Callimyrna Fig Orchard, Corning, California, September 9, 1918.

THE FIG IN THE SACRAMENTO VALLEY.

By I. J. CONDIT,[1] Fresno, California.

The fig industry is decidedly on the boom. The unprecedented high prices of the war period have stimulated planting to unthought of proportions and from all reports the demand for nursery stock presages still more extensive developments of fig orchards in 1920.

The idea seems to have become fixed in the minds of many that the fig tree is fool proof, is entirely free from insects and diseases, and will grow in all soils and under all climatic conditions. As proof of the last statement, attention is called by promoters to the luxuriant growth of fig trees across the road or half a mile north of the tract in question. That a few fig trees have reached maturity and produced some fruit is regarded by some people as sufficient evidence that commercial orchards of figs of the same or even of a different variety will bring profitable returns. There are many fig trees in the cities of Berkeley, Oakland and Alameda which produce fruit of fair quality, but this fact does not warrant the planting of fig orchards in the Bay district. There are fig orchards in the vicinity of Sacramento which produce good fresh fruit and some dried fruit, but the judgment of experienced fig men has so far prevented further development of the fig industry in that section on account of the high humidity. Unirrigated fig trees of several leading varieties growing at the University Farm, Davis, are subject to frost damage and have frequently been injured seriously. The fruit, moreover, of most varieties, except the Mission, sours on the least provocation. What can be said therefore of the outlook for the fig in the Sacramento Valley?

The writer had the pleasure of making a week's trip through the fig-growing sections of this valley in September, 1918, just before the heavy rain of that month, and another shorter trip in June, 1919. He saw isolated Smyrna fig orchards where twenty to thirty per cent of the crop was being destroyed by birds; he saw fig trees all through the valley losing their leaves and exposing their fruit to sunburn on account of the unprecedented dry seasons preceding; he saw Adriatic fig orchards with a large percentage of the crop split wide open and souring on the trees; he saw whole orchards of Smyrna figs which never produce a fig because of the failure to caprify the trees; and he learned later that from eighty to ninety per cent of the fig crop was lost on account of the rain and the wet weather following.

On the other hand, he visited some of the largest and finest Mission fig orchards in the state; feasted on some of the finest fresh Calimyrna figs he has eaten anywhere; saw probably the largest fig tree growing in the United States; walked through Adriatic fig orchards which are said to produce five and ocasionally eight tons of dried fruit per acre; and sampled more varieties of figs from one orchard than can be found anywhere else in California at one time. Whatever is written here, therefore, is stated with the advantages and disadvantages of varieties and climate in mind.

[1]Horticulturist, J. C. Forkner Fig Gardens.

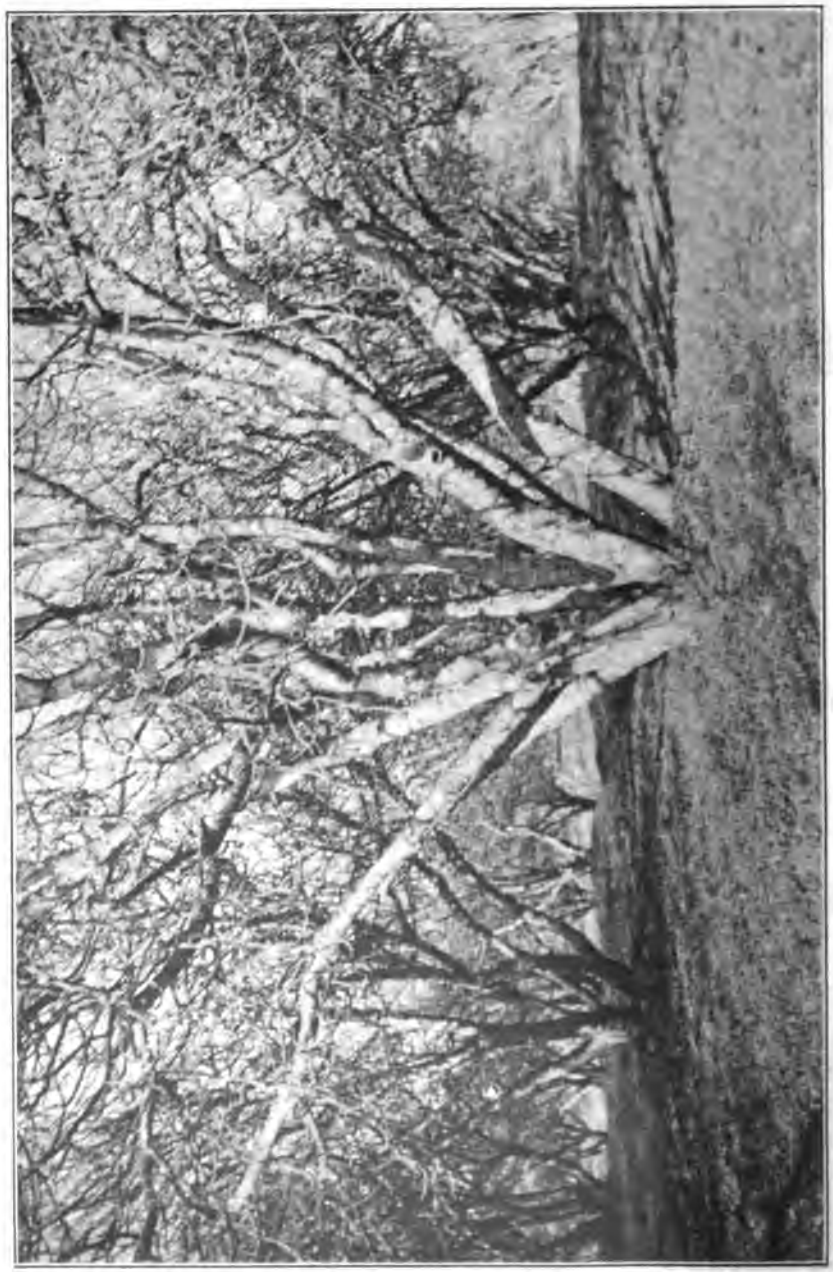

FIG. 166.—Large Adriatic Fig Trees, 26 years old. The Bell Orchard at Biggs, California.

There are but four varieties of figs being planted commercially in California today—the Mission, the Adriatic, the Smyrna, and the so-called Kadota.

The Adriatic fig is the chief drying variety of California at the present time. The bulk of the crop comes from border trees which are so largely planted around vineyards, especially in the San Joaquin Valley. Some of the oldest and most productive Adriatic orchards in the state are found, however, in the Sacramento Valley, namely, at Yuba City, Marysville, Oroville, and Biggs. The Adriatic tree leafs out in the spring about ten days earlier than the Calimyrna, has mature fruit sooner, and develops fruit over a longer season than the latter variety. On account of the earlier maturity of the crop it is more likely to escape damage from early rains in the northern sections where such rains are not uncommon.

On the other hand, the Adriatic is an inferior fruit both fresh and dried. The green fruit is unattractive both in color and flavor if picked in a sufficiently firm condition to ship to market. The dried fruit is dark in color and, like many other such products, is submitted to the fumes of sulphur for bleaching. The dried Adriatic fig never has competed and never will compete successfully with the imported Smyrna fig and least of all with the California Smyrna. As proof of this statement I will quote from letters by two eastern dealers in such products:

"The white Adriatic, grown in California, does not compare at all with the Smyrna, and, unless its character can be very materially changed, it will not be in competition with Smyrna figs at any time and will only fill the bill as a cheap fig."

"The California Adriatic fig, as you know, has a poor flavor and though it is largely used, even in some instances for fancy packages that sell at high prices, it can not, in our opinion, ever supplant the imported article except for manufacturing purposes because of its inferior flavor."

Mr. G. P. Rixford in his recent bulletin is still more emphatic regarding the Adriatic:

"Sometimes planters are advised to put out the Adriatic, under the mistaken idea that it is a heavier bearer than the former. Experience has demonstrated that if the Smyrna is liberally supplied with caprifigs, the reverse is the case. The eastern cities are flooded with the inferior Adriatic figs, the repulsive acid taste of which, derived from the sulphur used in bleaching, is giving California dried figs a bad reputation. Shippers should realize that they are doing irreparable injury to the fig trade by putting this inferior fruit upon the market. It must be apparent to anyone who has sampled the Adriatic fruit now found in quantities in the eastern cities that a great fig trade which will successfully compete with the imported Smyrna fruit can not be built up with this inferior Adriatic fruit."

The Calimyrna or Smyrna type of the fig has been producing crops in California only since 1900, following the successful introduction of the fig wasp necessary for pollination of the fruit. The most extensive developments of this fig have been in the San Joaquin Valley, in Fresno, Merced, and Stanislaus counties, although orchards are found north

of Sacramento, at Vacaville, Esparto, Yuba City, Monroeville, and Corning. The success of these orchards located in the Sacramento Valley has not thus far warranted extensive plantings. Caprification of the figs has been more or less of a problem on account of an insufficient supply of caprifigs. Some orchards at Corning have not been caprified for several seasons since sufficient caprifigs were not locally available. The quality of fruit when obtained is excellent, but the quantity has not been great. In humid atmospheres and in moist soils the Calimyrna figs both split and sour so that the percentage of culls is large. It seems to be a more exacting fig as to climatic and soil requirements than the other varieties here described. Under favorable conditions the tonnage is high and the quality most excellent. It is this fig which will meet the foreign competition and will gain a reputation for California dried figs in the East if properly packed under sanitary conditions.

The latest aspirant for fig honors is the so-called Kadota, a new and yet old variety, having been known in southern California since 1891. It was not until trees were fruited in orchard form in Tulare County that the peculiar qualities of the Kadota became recognized. The trees are very rapid growers and bear a first crop of large fruit and an almost continuous second crop of smaller figs until frost. The fruit has a thick rind which protects it from bruising and decay in distant shipments but which when dried produces a tough leathery product. The sugar and flavor seem to be developed in an early stage of maturity, making it an excellent fig for fresh fruit purposes, that is, for shipping, for preserving, canning, and candying. Jam made from Kadota figs is inferior in quality to that made from the Calimyrna and no great development for that product can be predicted. Briefly stated, my opinion of the variety is as follows: for distant fresh fruit shipments, for preserving and candying, the Kadota is unexcelled; for a drying fruit it has very little real value. Its future depends upon the extent to which the market for the fresh fruit products can be developed.

The black Mission, introduced by the Mission fathers, was the sole representative of *Ficus carica* in California until about 1850 and some trees over a hundred years old bear witness to the longevity of the tree. Many of the older trees and some of the orchards were planted for the purpose of producing a cheap but nutritious hog feed and it has hardly been much more than a decade that black figs have been packed extensively and sold in cartons for human consumption. The consuming public has become prejudiced in favor of a light-colored fig although black prunes have been a staple food product for years. The black fig does lose its attractiveness after a few weeks on the market on account of the formation of a white coating on the surface. Since appearance seems to count for more than quality with the buying public, the black fig has not attracted a wide market heretofore. The fruit has excellent quality, however, and those who learn how to process and pack the Mission fig properly may expect bountiful returns for their efforts in future years.

The Mission fig has an advantage over the Smyrna and the Adriatic in producing a first crop of large figs suitable for the fresh fruit market in addition to the main crop for drying. The fruit resists unfavorable weather conditions, does not sour or split readily, and requires very little handling after it drops. In fact the figs are sometimes picked up directly from the ground into sacks and sent to market

without other treatment, although such a product is bound to be inferior. Another point in favor of this fig is that the eye is practically closed, making it difficult for beetles and other insects to enter and lay their eggs.

The yields of marketable fruit from mature Mission fig trees in orchard form is equal to if not greater than that of any other variety. On account of the size which the trees attain even in the orchard, they must be planted greater distances apart than trees of the Adriatic or Smyrna. Mission trees at Woodland planted 40 by 40 feet are crowding each other and at Winters older trees set 55 by 55 feet are none too far apart. Individual trees are commonly found which are said to produce from 750 to 1,000 pounds of dried fruit. Packers and experienced fig men believe that the Mission fig, like the Mission olive, is an excellent variety for commercial planting on account of the quality, the certainty, and the size of its crop.

A recent writer on the subject of fig varieties expressed himself substantially as follows: Nothing is more delicious than the Calimyrna; nothing more remunerative than the Adriatic; nothing more certain than the Mission. Based on the facts stated above regarding soil and climatic requirements of these four fig varieties, my personal opinion is that for the Sacramento Valley no fig will be more surely remunerative than the black Mission.

STERILIZE THE FENCEROW AND REDUCE NEXT YEAR'S LOSSES.

By BRONTE A. REYNOLDS,[1] Sacramento, California.

FIG. 167.—The Russian Thistle (*Salsola kali* var. *tragus*). Note the automobile is backed into the clump. This weed is a growing menace to California agriculture.

[1]Editor, Department of Agriculture, State of California.

Of all the problems which have vexed the agriculturist and fruit grower, probably no one occupies so unique a place as that involved in the narrow strip of uncultivated land with the fence running down the center, commonly called the fencerow. It is at once a benign, friendly agent, but also one which simultaneously shelters and fosters two deadly and insidious evils—weeds and insect life.

I say unique, for in my rambles through agricultural literature, I have found but few references to comprehensive remedial measures, and yet I am impressed with the thought that there is an adequate remedy and that when fully developed it will be accepted and appreciated by the farmer and fruit grower alike.

FIG. 168.—Yellow star thistle. *Centaurea solstitialis.* A close relative of the Napa thistle which in the last 15 years has spread from a small area in the San Francisco Bay region through the valleys of the north Coast Ranges to the Sacramento Valley and is rapidly becoming established in the lower San Joaquin.

WHY THE FENCEROW IS A MENACE.

The average type fence does not permit of cultivation within a given distance on either side. In the area thus protected by the fence thrive sufficient noxious weeds and grasses which, unmolested, develop the seed to be sown by wind and other agencies from season to season. Upon these weeds, when in a green, succulent stage, a large number of our destructive insect pests feed, reproduce and hibernate, and from these locations as foci are dispersed into the adjacent cultivated crops to wreak their toll of damage with which we are already too well acquainted.

I can produce an hundred works on destructive insects, many with illustrations of fencerows, and show under "Control Measures" and "Repression," the admonition that adventitious growths, such as weeds, grasses, etc., protected by fences, be cut, burned or otherwise destroyed

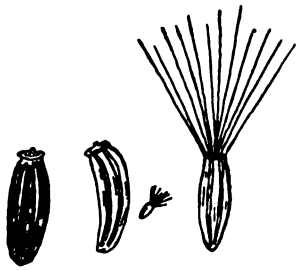

FIG. 169.—Canada thistle (*Cirsium arvense*) seeds.

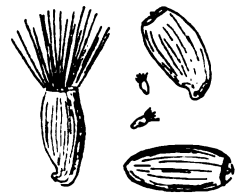

FIG. 170.—Yellow star thistle (*Centaurea solstitialis*) seeds.

in order that insects and weeds which ordinarily would be destroyed by cultivation shall find no hiberating refuge along the fence line.

The nearest approach to a practical solution for "doing away with this untilled area" involved by the average fence line was the novel but impracticable suggestion of a movable fence. The suggestion recommended was moving the movable fence, plowing or cultivating, and then putting the fence back.

FIG. 171.—Black mustard (*Brassica nigra*). The common yellow mustard of grainfields in the interior valley.

Now a fence has many functions. It keeps your stock in; it keeps your neighbors' stock out; it protects your orchard, your farm and your vineyard; and most important of all, usually it establishes the legal boundaries of a given estate; and for this last reason, as old and sound as "Magna Charta," the movable fence is impractical, for it would entail vexing legal difficulties.

Now as a matter of agricultural fact what else beside a few berry bushes or weeds ever occupied the uncultivated area protected by the fence? Nothing of commercial importance! Then why not "sterilize"

FIG. 172.—Prickly pigweed (*Amaranthus retroflexus*). A "tumbleweed" which produced millions of seeds to a plant, now generally distributed throughout the state.

this unproductive area, since it serves no agricultural purpose but to enclose and protect the environed land?

Thus we are confronted with the paradox wherein we build a fence to protect our crops and by so doing perpetuate broods of insects and noxious weeds, which cost more in wasted energy and actual losses than many other sources combined.

Now after many years of recurrent losses, let us take this fence problem and settle it for all time by chemically sterilizing this strip of three or four feet, in which nothing of value is produced, and in so doing wipe out both weeds and insect plagues that from time immemorial have been fostered under its benign influence.

"Sterilize the fencerow and save next year's crops from weed and insect losses!"

A WORD ABOUT CHEMICALS.

Crude oil, salt and other weed-killing preparations have disadvantages which preclude their wide use as sterilizing agents, since only partial success has followed their application, and at this time no more promising agent is available than some of the many types of arsenical poisons. After a given time no danger of stock poisoning would be entailed since nothing would grow in the poisoned fencerow area upon which stock would be tempted to feed.

WEED CONTROL ALONG FENCEROWS AND ROADWAYS.[1]

By GEORGE P. GRAY, Berkeley, California.

FIG. 173.—Canada thistle (*Cirsium arvense*), a perennial thistle constituting one of the worst pests of the Eastern States. It has not yet become generally established in California, but is gaining a foothold in various parts of the state, especially in Humboldt, Lake and Marin counties, whence it will surely spread over the entire state unless vigorous steps are taken for its eradication.

[1]University of California, Publications in Agricultural Science, Vol. 4, No. 2. 1919.

Frequent references are made in the literature to weeds growing along fencerows, roadways, etc., as being a refuge for insects when other food is not available. Weeds growing in waste places are a constant source of infestation of adjacent cultivated crops. The unsightly appearance of the average fencerow is too familiar to need more than bare mention.

These weeds cannot be destroyed by ordinary cultivation and where the attempt is made to clean up the fencerows it is usually done by

FIG. 174.—Wild morning glory (*Convolvulus arvensis*), the most troublesome orchard and garden weed yet naturalized in California. This illustration is misleading since the root-system is vertical, often penetrating the soil to a depth of 25 feet.

hand-mowing or by burning. Neither method is altogether satisfactory because the weeds are in evidence a good share of the year unless frequently mowed. The greatest need for cutting is at a time when the farmer is the busiest, and fence posts are often destroyed by burning. Some chemical of moderate price which would sterilize the soil and prevent the growth of weeds for a considerable time would avoid some of the difficulties mentioned above.

ARSENIC AS A STERILIZING AGENT.

Certain observations were made during experimental work on weed control which are interesting in this connection "incidental to the main object of the experiments, the control of wild morning-glory on agricultural land, data has been obtained which shows the superiority of arsenic as a soil sterilizer. While arsenic apparently has failed actually to eradicate the wild morning-glory, using as high as a pound to the square yard, it can be used as a soil sterilizer in respect to a great variety of weeds. All of the Centerville plots to which an ounce or more of arsenic trioxide had been applied per square yard were barren of all vegetation, except morning-glory, for fourteen months, notwithstanding the leaching by the rains of two winters. The minimum cost of materials for the production of this result was less than one cent per square yard or about forty dollars per acre." (At the present price of materials the cost would be about double.) "This would not be prohibitive for the prevention of weed growth on graveled walks, tennis courts, roadways, fencerows, or in other places where soil sterilization is desired.

FIG. 175.—Caltrop, groundbur-nut or puncture weed (*Tribulus terrestris*), a disagreeable alien which has firmly established itself in the upper San Joaquin Valley and parts of Southern California.

One significant fact in connection with soil sterilization is that any amount of arsenic in excess of one ounce per square yard appears to have been a waste of material unless future observations will show that larger amounts will have a more lasting effect."

COST OF MATERIALS.

The cost of materials to treat a strip of soil along a fencerow one yard wide and one hundred yards long would be about $2 at present prices, or $35 to sterilize a yard-wide strip around a 40-acre field.

PREPARING THE STOCK SOLUTION.

The preparation of a concentrated stock solution of arsenic is described in Circular 168 of the California Agricultural Experiment Station but is repeated here for more convenient reference.

The preparation of the poison presents no great difficulties or dangers if adequate facilities are available out of doors and the operator is at all familiar with the handling of chemicals. If a considerable amount is to be prepared the saving will be quite material. Extra precautions, however, should be observed at all times in the manipulation of arsenic.

Caustic soda (sodium hydroxide), or a good grade of concentrated lye, is much more active in dissolving arsenic than either sal soda or soda-ash and much less is required, although the cost per pound is greater. Very little heat is required in the preparation of sodium arsenite by means of these materials. If made in large quantities (five gallons or more) the use of heat is unnecessary. The following formula for the preparation of the stock solution is preferred on account of its simplicity:

Granulated caustic soda (98 per cent)	10 pounds
White arsenic (arsenic trioxide, 99 per cent)	20 pounds
Water, to make	5 gallons

The solution may be made as follows: Dissolve the caustic soda in about two gallons of water in a metal or wooden vessel (preferably iron) and while still hot, add the dry arsenic, about a pound at a time, at a sufficient rate so that the solution is just at the point of boiling, but does not actually boil. Stir continuously during the addition of the arsenic and until all is dissolved. Considerable heat is produced by dissolving the caustic soda. Additional heat is furnished by the chemical reaction involved in the union of the caustic soda with the arsenic to form sodium arsenite. After all the arsenic is dissolved, let the solution cool and add water to make exactly five gallons.

Caution. Do not add cold water to the hot solution. An explosion may result, as the solution is hotter than the boiling point of water.

If, for any reason, the arsenic fails to dissolve without the use of heat, a solution can be made by warming the mixture, unless the materials are of low grade. If hard water is used there will be some insoluble matter in suspension; but it may be disregarded unless present in large amount.

The above makes a convenient stock solution for diluting to any desired strength; that is, each gallon contains four pounds of arsenic trioxide; a quart, one pound; each fluid ounce contains one-half ounce of arsenic trioxide.

PROPORTIONS OF MATERIALS.

For each square yard to be treated take two fluid ounces of the stock solution described and mix with one gallon of water; or for every 100 square yards take one and one-half gallons of the stock solution and mix with 100 gallons of water. The solution may be applied to smaller areas by means of an ordinary garden watering pot, using one gallon of the solution to each square yard. A barrel or tank may be mounted on a sled and connected to a sprinkling device for treatment of larger areas. The rate of delivery will have to be regulated by experiment, but it is important that each square yard shall receive an amount of the solution containing at least the equivalent of one ounce of arsenic trioxide.

If the soil is thickly covered with either living or dead weeds it will be well to remove them as completely as possible before the poison is applied. The weeds will not materially assist in carrying the poison to the soil and the amount adhering to them will be wasted.

COMMERCIAL WEED KILLERS.

Ready prepared solutions of arsenic similar to the above are common articles of commerce but are almost invariably sold under trade names as a "weed-killer discovery." The arsenical content varies from one-half to four pounds of arsenic trioxide per gallon and their composition as a rule is surrounded with an air of mystery. The exorbitant prices so often charged for these solutions can only be accounted for as an apparent attempt to obtain royalties on alleged "wonderful discoveries" in weed control methods. A specimen of weed killer was recently examined which was being sold at $2.50 per gallon but which could be made for 14 cents per gallon for cost of materials and a few cents more for cost of preparation. These facts largely prevent their recommendation for use in weed control or in preparing grasshopper poisons, and necessitate their being classified in the fake class.

DANGER TO LIVE STOCK.

If this powerful agent of destruction is to be employed as a tool for the control of weeds, the user must be alert to the fact that it is a destroyer of both animal and plant life, the harmful and beneficial alike. Ample precautions should be taken to prevent live stock from eating the poisoned grass which may remain on the soil.

CIRCUMVENTING THE PEAR BLIGHT.

By W. L. Howard[1], Davis, California.

At the present time there is widespread interest in pear stocks that are resistant to pear blight.

Professor Reimer of Oregon has tried to make the blight grow in the Surprise pear by artificially introducing the germs into the circulation, but they would not grow to amount to anything.

The Surprise pear being immune to blight has led people to ask if it can not be used as a stock on which to grow Bartletts, which as everyone knows, is very susceptible to the blight. The Bartlett apparently

[1]Pomologist, University of California.

makes a fine union with the Surprise, and on the other hand, the Surprise makes a fine open symmetrical growth, thus enabling the grower to train his trees in any general shape he may desire.

While the Surprise seems to be an excellent stock for the Bartlett from the grower's viewpoint, it unfortunately is not available in nursery quantities. It should be remembered that our common fruit tree root stocks are produced from seed, and are therefore easily propagated in large quantities. So far as we know, there is only one Surprise pear tree in the United States of bearing age. This is located on the experiment station grounds of the University of Missouri at Columbia. The writer planted this tree about twenty years ago.

As noted in the station records taken at the time this tree was planted it was recorded as having come from a Missouri nursery, but that nursery later on when the question came up, said they had never heard of it before.

The Surprise pear became of interest only when Professor Reimer discovered that it was practically immune to blight. The Division of Pomology of the University of California has been growing as much of the Surprise at Davis as possible for grafting and budding purposes. A number of trees have been top worked to this variety, but are not yet in bearing.

It is not known whether seedlings from the Surprise tree would be as immune to blight as the parent tree; this is yet to be determined. The best we can do now is to bench graft the Surprise scions upon the Japanese seedling pear roots. By using a long scion and a comparatively short root, the former may be made to form roots of its own. After growing for a year, the little trees may be dug up and the Japanese part of the root removed. However, it is more convenient and perhaps the trees might grow off better if left on the Japanese root, but planted rather deeply in the soil so that no sprouts would be likely to arise. The Japanese stock itself is fairly resistant to blight, although far from being immune. Allow the Surprise tree on the Japanese root to grow up when it is given the desired shape by pruning during the first two years. After the desired shape has been secured the main branches may then be grafted to Bartlett.

It should be stated emphatically that no degree of immunity to blight is conferred upon the Bartlett by reason of its being top worked upon the wholly resistant Surprise; the only object in doing this is to make it impossible for the blight to kill more than a branch or two of any orchard tree in any one year. If the blight attacks a branch and is allowed to spread downward it will have to stop when it reaches the point where the grafting was done.

Since blight usually occurs early in the season, it is highly probable that if the blighted part were cut off at once that sprouts would arise from the Surprise stump, and these could be budded during the same season. If the buds did not take, the stumps could be grafted again the following spring. By this plan it would be necessary to graft the trees in the orchard.

Some growers would object to this on account of the trouble, while others seem perfectly willing to go to any trouble to protect their trees from being killed by blight.

OFFICE OF STANDARDIZATION.

Report for the Period July 22 to September 30.

By AVERY S. HOYT[1], Sacramento, California.

The act creating the Department of Agriculture provided for at least two divisions of that department, one to be known as the Division of Plant Industry and the other as the Division of Animal Industry. The Director of Agriculture, in organizing the work of the Division of Plant Industry, recognized the growing importance of the standardization work by establishing the Office of Standardization.

The work of executing the provisions of the two standardization laws is charged to the Director of Agriculture and to the county horticultural commissioners. Standardization, if it is to be made of maximum value to producer and consumer alike, must be equitably applied and uniformly enforced in every section of the state. To the consumer everywhere standardization of California-grown products must be made to mean an honest pack, a sound product and full value. When this reputation is thoroughly established, the California producer will find the standardization to him means an assured market, an increased demand and satisfied customers.

The county horticultural commissioners have had practical experience in the execution of standardization laws. They are thoroughly familiar with the conditions and requirements of their respective counties. Standardization, however, as its name implies, must be statewide in character and its application in all cases should be based on the best interests of the state as a whole. Consequently, one of the chief functions of the Office of Standardization is to unify and co-ordinate the work done in the various counties, in order that consumer and producer alike may share and share equally in the benefits resulting from this work.

There is given below some of the results of the statewide application of the standardization laws covering the period from July 22 to September 1. Study of this compilation will indicate that the county horticultural commissioners have been active in standardization and, what is more important, that this activity has not been confined to a single county but that uniform action is already under way in many counties of the state.

[1]Superintendent of Standardization, Department of Agriculture, State of California.

VIOLATIONS OF STANDARDIZATION LAWS REPORTED BY COUNTY HORTICULTURAL COMMISSIONERS AND STATE STANDARDIZATION INSPECTORS DURING AUGUST, 1919.

Fruit and vegetables	Boxes	Violation	Disposition
Alameda County—			
Peaches	457	40 per cent insect infestation	Repacked, returned or destroyed.
Peaches	41	Variation in layers	Repacked, returned or destroyed.
Pears	197	25 per cent insect infestation	Repacked, returned or destroyed.
Grapes	300	No markings	Marked
Plums	16	Variation in layers	Condemned
Apples	262	Wormy	Repacked or condemned
Tomatoes	206	Deceptive pack	Repacked or condemned
Los Angeles County—			
Apples	57	Wormy	Resorted
Marin County—			
Pears	20	8 per cent insect infestation	Resorted
Peaches	6	50 per cent insect infestation	Resorted
Plums	2	Variation in layers	Resorted
Apples	20	Wormy	Resorted
Nevada County—			
Pears	142	20 per cent insect infestation	Resorted
Sacramento County—			
Pears	276	6 to 100 per cent insect infestation	Repacked, returned or sent to county hospital
Grapes	75	Below sugar requirement	By-products factory
Prunes	215	Variation in layers	Sold loose in lugs
Apples	59	Wormy	Condemned
Apples	50	Not properly marked	Marked
San Francisco Co.—			
Apples	5,715	Not properly marked	Marked
Apples	348	3 to 10 per cent wormy	Repacked
Apples	207	10 to 20 per cent wormy and San Jose scale	By-products
Apples	609	20 per cent and over wormy and San Jose scale	Condemned
Santa Clara County-			
Tomatoes	73	Variation in layers	Repacked
Apples	66	Wormy	Resorted

NOTE.—On checking up the violations for the months of August and September, the following is worthy of notice:

	August	September
Oriental offenders	33	12
All others	32	16

In all of 93 cases, 45 offenders were of Oriental extraction.

CONVICTIONS UNDER THE STANDARDIZATION LAWS DURING AUGUST, 1919.

Fruit and vegetables	Offense	Accused	Result
Alameda County—			
Tomatoes	Deceptive pack	Serpino Rossi	$5 00
Apples	Over 3 per cent insect infestation	E. O. Austin	50 00
Pears	Violation section 2, Standardization Law	Costontino Doglio	*
Apples	Over 3 per cent insect infestation	H. Resnick	50 00
Apples	Over 3 per cent worms	Peter Caviglia	50 00
Apples	Over 3 per cent worms	Josephine Pezzola	50 00
Apples	Over 3 per cent worms	V. Grego	†
Pears	Over 3 per cent worms	Antone Lucas	10 00
Apples	Over 3 per cent worms	J. L. Vieira	50 00
Apples	Over 3 per cent worms	Michele Supioni	50 00
Apples	Over 3 per cent worms	M. S. Silva	50 00
Pears	Over 3 per cent worms	Madge Doglio	10 00
Placer County—			
Pears	Over 3 per cent worms	F. Sakata	25 00
Peaches	Not uniform in size	S. Shintaki	25 00
Plums	Not uniform in size	C. F. Soto	25 00
Peaches	Not uniform in size	Wong Fong	15 00
Pears	Windfalls—wormy	Y. Matsumoto	50 00
Peaches	Not uniform in size	Ah Chee	15 00
Peaches	Wormy—split	K. Yonemura	50 00
Pears	Windfalls—bruised	S. Kurimoto	25 00
Peaches	Not uniform in size	Y. Matsumoto	25 00
Peaches	Not uniform in size	S. Uyeki	15 00
Peaches	Not uniform in size	Antone Perry	15 00
Peaches	Wormy—split	Geo. Okusako	20 00
Sacramento County—			
Strawberries	Green and overripe	S. Miyasahi	25 00
Strawberries	Overripe	S. Ouchi	25 00
Strawberries	Overripe	Sumi Orita	25 00
Strawberries	Green and overripe	K. Sakuma	25 00
Strawberries	Overripe	M. Watonabe	25 00
Strawberries	Overripe	C. Yamamoto	25 00
Strawberries	Overripe	S. Neneshi	25 00
Strawberries	Overripe	T. Endo	25 00
Strawberries	Overripe	E. Enouye, alias T. Ochi	25 00
Strawberries	Green and overripe	H. Hiroshima	25 00
Strawberries	Green and overripe	R. Masuda	25 00
Strawberries	Overripe	C. Miyasahi	25 00
Pears	Violation Standardization Law	James C. Anderson	20 00
Apples	Wormy	Howard Reed	50 00
Pears	Wormy	Santos Sporo	25 00
Tomatoes	Violation Standardization Law	K. Sunahara	25 00
Tomatoes	Deceptive pack	T. Takata	25 00
Pears	Insect infestation	K. Takata	25 00
Pears	Violation Standardization Law	John Doe Nakamura	25 00
Plums	Green—overripe and variation in size	L. Logomarsino	25 00
San Diego County—			
Pears	Wormy	Frank Forbes	10 00
Pears	Wormy	Joe Miller	10 00
Pears	Wormy	W. J. Boulden	10 00
Pears	Wormy	G. A. Streeter	10 00
Pears	Wormy	G. W. Thomas	20 00
Apples	Wormy	E. W. Dickinson	50 00
Apples	Wormy	S. I. Holcomb, Jr.	50 00
Tomatoes	Deceptive pack	O. K. Produce Co.	20 00
Tomatoes	Deceptive pack	Silver Gate Prod.	10 00
Tomatoes	Deceptive pack	H. Plumer	25 00
Tomatoes	Deceptive pack	Bo Yut Produce Co.	20 00
Tomatoes	Deceptive pack	Latt'mer Bros.	20 00
Peaches	Deceptive pack	O. H. Catron	20 00
Apples	Wormy	J. S. Young	50 00
Apples	Wormy	W. D. Simmonds	50 00

*Wrong court. Suit dismissed.
†Not guilty.

CONVICTIONS UNDER THE STANDARDIZATION LAWS DURING AUGUST, 1919—Continued.

Fruit and vegetables	Offense	Accused	Result
Stanislaus County—			
Cantaloupe	Violation Standardization Law	E. Akiyama	10 00
Cantaloupe	Violation Standardization Law	T. Tada	10 00
Cantaloupe	Violation Standardization Law	Y. Tanase	10 00
Cantaloupe	Violation Standardization Law	E. Tugimoto	10 00
Cantaloupe	Violation Standardization Law	Miyakawa, No. 25, Central C. C. Co.	25 00
Cantaloupe	Violation Standardization Law	A. Madeline	10 00

VIOLATIONS OF STANDARDIZATION LAWS REPORTED BY COUNTY HORTICULTURAL COMMISSIONERS AND STATE STANDARDIZATION INSPECTORS DURING SEPTEMBER, 1919.

Fruit and vegetables	Boxes	Violation	Disposition
Alameda County—			
Tomatoes	154	Deceptive pack	Unknown
Tomatoes	7	Deceptive pack	Condemned
Tomatoes	20	Wormy	Unknown
Pears	8	From 3 per cent to 10 per cent wormy	Unknown
Apples	119	Not properly marked	Marked
Apples	120	From 3 per cent to 10 per cent wormy	Unknown
Apples	6	From 3 per cent to 10 per cent wormy	By-products
Peaches	15	From 3 per cent to 10 per cent wormy	Unknown
El Dorado County—			
Apples	14	From 3 per cent to 10 per cent wormy	Resorted
Apples	1	From 10 per cent to 25 per cent wormy	Resorted
Pears	39	Not uniform in size	Resorted
Peaches	9	Not uniform in size	Resorted
Fresno County—			
Apples	1 616	Not properly marked	Unknown
Apples	985	Immature and defective	Unknown
Los Angeles County—			
Grapes	1,190	Below sugar test	Returned, and sent to by-products factory
Apples	2,612	Not properly marked	Marked
Apples	15	From 3 per cent to 10 per cent wormy	By-products
Tomatoes	547	Not properly marked	Marked, or jumbled
Madera County—			
Apples	10	Not properly marked	Marked
Apples	5	From 3 per cent to 10 per cent wormy	Unknown
Apples	17	Not uniform in size	Unknown
Placer County—			
Apples	1	Not properly marked	Marked
Apples	14	From 3 per cent to 10 per cent wormy	Repacked
Apples	1	From 10 per cent to 25 per cent wormy	Destroyed
Apples	15	Not uniform in size	Resorted
Peaches	2	Not properly marked	Unknown
Sacramento County—			
Pears	5	From 3 per cent to 10 per cent wormy	Condemned
Grapes	44	Overripe and rotten	Condemned
Apples	7	From 10 per cent to 50 per cent wormy	Condemned
San Francisco Co.—			
Apples	2,523	Not properly marked	Marked
Apples	203	From 3 per cent to 10 per cent wormy	Resorted
Apples	643	From 10 per cent and up	Condemned
Stanislaus County—			
Grapes	2,434	Overripe	By-products
Yolo County—			
Apples	1	Over 25 per cent wormy	Condemned
Pears	208	From 3 per cent to 10 per cent wormy	Repacked
Pears	77	From 10 per cent to 25 per cent wormy	Repacked
Pears	2	From 10 per cent to 25 per cent wormy	Condemned

CONVICTIONS UNDER THE STANDARDIZATION LAWS DURING SEPTEMBER, 1919.

Fruit and vegetables	Offense	Accused	Result
Alameda County—			
Apples	Badly infested with codling moth	B. F. Gober	*
Peaches	Infested with 50 per cent insect pests	L. Moresco	$50 00
Apples	Infested with 50 per cent codling month	J. B. Rose	50 00
Apples	Infested with 50 per cent codling month	T. Iwasaki	50 00
Apples	Infested with 50 per cent codling month	K. Inouye	100 00
Pears	Infested with over 50 per cent codling moth	A. Quistibace	100 00
Tomatoes	Deceptive pack	Henry Perry	10 00
Apples	Infested with over 25 per cent codling month	Emilio Polari	50 00
Apples	Infested with over 25 per cent codling month	Tom Noma	50 00
Tomatoes	Infested with over 10 per cent insect pests	B. M. Sugimoto	20 00
Tomatoes	Infested with over 10 per cent insect pests	Y. Tomio	20 00
Tomatoes	Infested with over 25 per cent insect pests	M. Kurasaki	25 00
Tomatoes	Infested with over 15 per cent insect pests; also deceptive pack	M. Okutani	25 00
Tomatoes	Infested with over 10 per cent insect pests; also defective pack	George Fugino	25 00
Apples	Infested with over 20 per cent codling moth	G. Lupoi	50 00
Pears	Infested with over 20 per cent codling moth	Tony Silva	50 00
Tomatoes	Infested with over 15 per cent insect pests	R. Tajima	20 00
Tomatoes	Infested with over 20 per cent insect pests	M. Kurasaki	†50 00
Apples	Infested with over 20 per cent codling moth	Joe Olivera	50 00
Pears	Infested with over 40 per cent codling moth	Kwong Yuen	20 00
Apples	Violation section 5, Apple Standardization Law	Pete Scatena	50 00
Pears	Infested with 20 per cent codling moth	M. K. Silva	†50 00
Apples	Infested with over 50 per cent codling moth	G. Pallenti	50 00
Pears	Infested with over 75 per cent codling moth	J. Seda	30 00
Los Angeles County—			
Apples	Infested with 40 per cent codling moth	Klein Simpson Fruit Co.	‡300 00
Placer County—			
Peaches	Wormy; split pits and not uniform in size	C. Nishimoto	25 00
Peaches	Wormy; split pits and not uniform in size	Wong Goe	50 00
Peaches	Wormy; split pits and not uniform in size	K. Sasakai	25 00
Peaches	Not uniform in size and over 10 per cent total defects	S. Yonemura	50 00

*On probation until December 24, 1919.
†Second offense.
‡Fine suspended.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF OCTOBER, 1919.

By FREDERICK MASKEW.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	55
Passengers arriving from fruit fly ports	6,730

Horticultural imports:	**Parcels**
Passed as free from pests	139,077
Fumigated	428
Refused admittance	56
Contraband destroyed	49
Total parcels horticultural imports for the month	139,610
Sterilization (empty containers)	16,998

From Arizona: **Pests Intercepted.**

Laspeyresia pomonella in pears.

From China:

Lepidopterous larvæ in dry roots.
Lepidopterous larvæ in tea.
Araecerus fasciculatus in dried yams.

From Florida:

Phomopsis citri, Lepidosaphes beckii and *Parlatoria pergandii* on grapefruit.

From Guam:

Lepidosaphes mcgregori and *Aspidiotus latania* on cocoanuts.

From Hawaii:

Ripersia palmarum, Hemichionaspis minor and *Chionaspis inday* on cocoanuts.
Howardia biclavis, Pseudaonidia clavigera Coccus elongatus, Saissetia nigra, Pseudococcus filamentosus and an undetermined Tetranychid on hibiscus cuttings.
Saissetia nigra, Coccus elongatus, Aspidiotus latania, Aspidiotus cyanophylli and *Pseudococcus* sp. on bulbs.
Diaspis bromelia and *Pseudococcus bromelia* on pineapples.
Coccus elongatus on betel leaves.

From Idaho:

Laspeyresia pomonella in apples.
Scab and Rhizoctonia on potatoes.

From Illinois:

Undetermined mite on bulbs.

From India:

Aspidiotus latania on green cocoanuts.

From Iowa:

Laspeyresia pomonella in apples.

From Japan:

Lepidopterous larvæ in seed pods.
Lepidopterous larvæ in onion sets.
Weevil (undetermined) in beans.
Bruchus chinensis in peas.
Calandra oryzæ in maize.

From Manila:
Solenopsis geminata var. *rufa* in packing of household goods.
Lepidopterous larvæ and undetermined weevil in garbanzos.

From Mexico:
Lepidosaphes beckii on limes.

From Michigan:
Laspeyresia pomonella in apples.

From Nevada:
Laspeyresia pomonella in apples.
Heterodera radicicola in potatoes.

From Oregon:
Laspeyresia pomonella in apples.

From Pennsylvania:
Undetermined mite and aphid on ornamental plants and grasses.

From Washington:
Laspeyresia pomonella in pears.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	21
Fish boats inspected	12
Passengers arriving from fruit fly ports	6

Horticultural imports:

	Parcels
Passed as free from pests	141,394½
Fumigated	2
Refused admittance	12
Contraband destroyed	17½
Total parcels horticultural imports for the month	141,426

From Arkansas: **Pests intercepted.**
Aspidiotus perniciosus and *Lepidosaphes ulmi* on apples.

From Central America:
Asphidiotus cyanophylli, Pseudococcus sp. and *Icerya purchasi* on bananas.

From Connecticut:
Eriosoma lanigerum and *Aspidiotus perniciosus* on apples.

From Idaho:
Rhizoctonia and scab on potatoes.
Laspeyresia pomonella on apples.

From Illinois:
Pseudococcus sp. on calla bulbs.

From India:
Dipterous larvæ in peppers.

From Massachusetts:
Lepidosaphes ulmi on apples

From Mexico:
Aspidiotus perniciosus on apples.

From Ohio:
Tetranychus mytilaspidis on rose plants.

From the Orient:
Lepidopterous pupa and larva on shelled peanuts.

From Pennsylvania:
Pseudococcus sp. and *Coccus hesperidum* on crotons.

From Washington:
Laspeyresia pomonella, Venturia pomi, Tetranychus sp., *Leptothyrium pomi* and *Lepidosaphes ulmi* on apples.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	28
Fish boats inspected	110
Passengers arriving from fruit fly ports	47

Horticultural imports:

	Parcels
Passed as free from pests	7,873
Fumigated	0
Refused admittance	3
Contraband destroyed	3
Total parcels horticultural imports for the month	7,879

Pests intercepted.

From Central America:

Aspidiotus cyanophylli and *Pseudococcus* sp. on bananas.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	3
Passengers arriving from fruit fly ports	0

Horticultural imports:

	Parcels
Passed as free from pests	1

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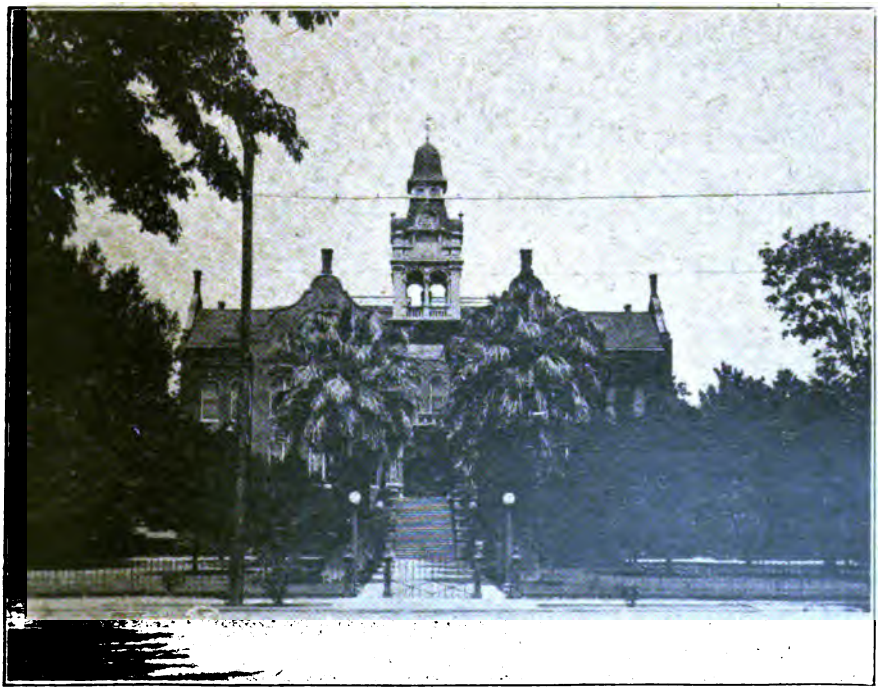
Volume VIII Numbers 11-12

MONTHLY BULLETIN
OF THE
DEPARTMENT OF AGRICULTURE
STATE OF CALIFORNIA



NORMAL SCHOOL, CHICO: WHERE THE CONVENTION WAS HELD

PROCEEDINGS
OF THE
Fifty-second Convention of Fruit Growers and Farmers
CHICO, CALIFORNIA, NOVEMBER 10-15, 1919

HELD UNDER THE AUSPICES OF THE

State Department of Agriculture

SACRAMENTO, CALIFORNIA NOVEMBER - DECEMBER, 1919

CONTENTS.

The Sir Joseph Hooker Oak, Chico, California. Estimated age 1000 years.

THE MONTHLY BULLETIN

CALIFORNIA STATE DEPARTMENT OF AGRICULTURE

Volume VIII NOVEMBER-DECEMBER, 1919 Nos. 11-12

PROCEEDINGS

OF THE

Fifty-second Convention of Fruit Growers and Farmers

Held under the auspices of the

California State Department of Agriculture

AT

CHICO, CALIFORNIA

NOVEMBER 10-15, 1919

SACRAMENTO, CALIFORNIA

Driveway, Bidwell Mansion Grounds, Chico, California.

THE MONTHLY BULLETIN

DEPARTMENT OF AGRICULTURE

STATE OF CALIFORNIA

DEVOTED TO AGRICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical, biological and other publications of a similar nature.

G. H. HECKE, Director----------Censor

BRONTE A. REYNOLDS, Assistant Secretary----------Editor

Entered as second-class matter October 6, 1919, at the post office at Sacramento, California, under the act of June 6, 1900.

Vol. VIII NOVEMBER-DECEMBER, 1919 Nos. 11-12

PROCEEDINGS OF THE MEETINGS.

Wednesday, November 12, 1919.

Morning Session.

The Fifty-second Convention of the State Fruit Growers and Farmers of California was opened on Wednesday, November 12, 1919, at 9 a.m., in the auditorium of the State Normal School, Chico, Butte County, California, Sherman A. Reynolds, Mayor of Chico, presiding. The Convention was held under the auspices of the State Department of Agriculture.

ADDRESS OF WELCOME.

The Chairman—LADIES AND GENTLEMEN OF THE CONVENTION: I have been asked on behalf of the city of Chico to extend a welcome to the delegates of the various parts of the State of California who are with us on this occasion.

It is a very pleasant duty and a very easy thing to do, to come before a body organized and convened for the purposes for which this body has been created, to extend a welcome from and to a locality such as that surrounding the city of Chico. But to express the full depth of the cordiality is not such an easy task, and I will, therefore, confine myself to the stereotyped statements made on occasions of this kind.

You are welcome, entirely welcome, cordially welcome. And you are all aware of the sincerity with which these sentiments are expressed.

I would it were possible for me to extend to you the hearty and rugged greeting of the western pioneer, but I do welcome you with such feelings of cordiality that such a pioneer as General Bidwell would extend to you this morning. I know his welcome would be ardent and

I know he would take pride and happiness in knowing that such an intelligent body as this, engaged in the work you are engaged in, has met here to take part in this convention.

In making up the program for this convention there were many things of vital interest, and only those of utmost importance to us at the present time could be emphasized in this short session; and those things will be brought before you. With your kind permission, I am going to use this opportunity and privilege to say what to me is most important in those things.

One of these is standardization of products. If there is any one who understands what that means it must be the commercial dried fruit packer. I like to use another term than standardize: I like the term, "Absolute honesty in the quality and quantity of the products sold."

I do not want you to draw the conclusion that the commercial packers and the dealers in articles produced in the fields and orchards have found the farmers dishonest people. Quite the contrary. But are they absolutely honest with themselves in the preparation of the products that they turn out for other people to eat and consume?

I am not going to attempt to answer that question. It will be taken up later in the day by people who are experts in that line, who can discuss it far better than I can.

There is another point I want to call your attention to and that is the part of our program set aside for co-operation—the effort to form associations.

The United States, in its economic life today, faces one of the greatest crises ever known in its history. Everything seems to be out of joint. Every line of industry, the railroads and every line of national effort are being unionized, centralized, controlled. It would be but natural that the different interests seek self-protection and move to encroach upon the rights of those not organized; therefore, there must be 100 per cent co-operation among the producers in the State of California or there is a strong likelihood that their constitutional rights will be imposed upon and that the industries will not receive the protection which their importance deserves. (*Applause.*)

In line with what I have just said on standardization, I will say also that it is my belief that standardization can only come from 100 per cent organization of the producers.

True enough there are officials appointed for the purpose. We can have legislative control. We have the Department of Weights and Measures, and in the line of work in which you are interested this department has done a wonderful work. But the future of absolute standardization must come from the producers themselves, and it can only come when they are 100 per cent organized.

Chico extends a welcome to a convention organized for this purpose. Your interests are of vital interest to us. Outside of the lumber industry and outside of the manufacturing, controlled here by the Diamond Match Company, we depend entirely for our livelihood, our prosperity and our happiness upon the fertility of this section, and we watch with a great deal of interest the work of this convention.

Other features of this program are frost control, spraying, fertilizers and all those things that tend to increase the quantity and the quality of production.

Talk to any man who has had experience in selling on the market or handling of products and he will tell you it is far easier to market a fancy article at a fancy price than it is one of lower grade and lower price. This program, as laid out by Mr. Hecke here, shows that he has a grasp of those things and the increased quality of production must absolutely accompany increased quantity of production if we are to be successful.

There is another subject that is not upon the program that I am going to take the liberty of calling to your attention, and before I do so I wish to state that I appear here as an officer of the city of Chico, not as an officer of this convention, nor as a delegate.

This subject can not be taken up at this time in this convention because of the fact that the peace treaty is before Congress, and any action taken under the auspices of state control involves responsibility upon the officials in the same work in our national capitol and would have the tendency to give the idea that there was a lack of confidence in the government, and we do not want that.

I refer to the unfortunate ownership of property by Asiatics in California.

There is no problem that faces us that has not its lesson, and I wish to say this, that before we draw our criticisms too fine in regard to their acts it would be well for us, in some manner, to study their ideas and study their ways of working. We ourselves must not take a back seat if we compete with them on the same ground.

The farmers in any of the counties or in any community in the State of California, could, with as much effort, carry as complete a system of books and as complete a knowledge of every detail of their business as is carried by these people.

I do not wish to become bitter on this subject, but I do say first, last and all time, I am an American. (*Applause.*) I am a Californian. To me the tales of Valley Forge, the tales of the sufferings of the pioneers at Donner Lake, are sacred. I hold them in high regard. I love to listen to the stories of the gallant veterans of the bloody fields of Gettysburg. I also love to listen to the stories of those who came into this country across the plains of alkali, in blistering heat, or the high Sierras in wintry cold, suffered poverty and established this mighty empire of the Pacific. Every foot, therefore, of it to me is sacred, and I say it is absolutely too sacred a community to have any race of people or any individual who is so far below normal in his realization of the sanctity of marriage as to consummate it with a photograph and, thereby, to evade the laws of the State of California in order to obtain possession of this land. (*Applause.*)

I will go farther than that and say that this soil to me is too sacred to be owned or controlled by any individual who does not hold sacred those other things which all nations hold sacred, the sanctity of motherhood, and use the issue from these marriages for the purpose of acquiring the land in the name of what to us are more or less illegitimate children.

This is vital to us. There is in this valley, this situation: Within a very short distance an enormous acreage of rice, wherein this condition of affairs confronts us in a most vital way. This acreage stretches from about five miles from this enormous park as far south almost as Sacramento. That question presents one of the most important issues of the

day. I will say to you that one-third of this acreage is at the present time under Asiatic control and the percentage is fast increasing to one-half.

That industry, gentlemen, was pioneered by American brains; it was engineered by American pioneers; it was fostered by American money, and its products have been, up to very recently, marketed and handled by American citizens.

It is with great pleasure that I now introduce to you the Honorable G. H. Hecke, Director of Agriculture of the State of California. (*Applause.*)

(*Mr. Hecke hereupon took the chair and presided over the meeting for the rest of the session.*)

RESPONSE TO ADDRESS OF WELCOME.

The Chairman—MR. MAYOR, LADIES AND GENTLEMEN OF THE FIFTY-SECOND FRUIT GROWERS' CONVENTION:

I am sure that I am voicing the sentiments of every lady and gentleman, of every delegate in this convention, if I give some words of appreciation for the splendid reception that the county of Butte and the city of Chico are according to the delegates of the Fruit Growers' Convention.

We had our last convention in the southland, in beautiful Riverside. There came to us at that time the invitation from Chico to hold the fifty-second convention in the county of Butte.

The people who attended the convention at Riverside, the growers of southern California, and the county horticultural commissioners, knew that there was in the north a county that did not have a superior in the State of California. We knew that the climate was as good as the climate of any county in this great state of ours. We knew what progress had been made in the growing of the olive and citrus fruit in the county of Butte, in the vicinity of the city of Oroville; and we knew of the possibility of growing deciduous fruits in the vicinity of Chico. We knew that the United States Department of Agriculture, through its plant introduction work, had found several conditions favorable for the importation of foreign plants and seeds, and that they had finally selected a locality close to the city of Chico, only four miles from here, the location that was visited yesterday by representatives of approximately forty-five counties. I can assure you that every one of the county horticultural commissioners was impressed with the work that the United States Department of Agriculture has accomplished there for the American farmer.

We know that in Butte County there exists a splendid example of how the American citizen can be brought back to the soil by means of such a settlement colony as you have at Durham, which we will visit next Saturday. I hope that all delegates will take time to be with us on that occasion. I am sure you will not be disappointed and that you will find in this land settlement at Durham, to a certain extent, the solution of the serious question which you have so patriotically touched upon here, Mr. Mayor.

Now, why do you hold conventions? This is the fifty-second Fruit Growers' Convention. They are not merely opportunities of getting together and meeting one another to discuss questions of the day. They are the occasion for serious discussions of those questions which interest

you and for the getting together of the representatives of the farming interests at these conventions.

I can go back over a number of years. This is the fifty-second convention, not the fifty-second annual convention. Sometimes there have been two conventions in one year. Hence it is not fifty years ago since these conventions were started. They were started about thirty-five years ago. And in looking over the old records containing the history of the growth of agriculture in California, we find that in practically every convention something has been accomplished that has bettered the farming conditions in the State of California.

To go back a few years, we had a convention in Napa. That started, Mr. Mayor, the standardization work in this state and put it on a firm basis.

We had a convention during the war at Sacramento, when the farmers insisted on having representation there in connection with the State Council of Defense, and we got that.

We had a convention at Riverside, where representatives of eleven western states, of British Columbia and of Lower California, as well as of the Hawaiian Islands, met for the purpose of discussing and formulating rules for the different states to make them as uniform as possible and thereby make the western states of the United States, of which California is the most important, just as safe as possible.

What we are going to accomplish at this convention remains to be seen, but in my address which I will take pleasure in presenting to you now, Mr. Mayor, I will touch upon suggestions that may help us in putting the farmers into the front rank, and with your aid I may be able then to take the right stand and aid them in the struggle you indicated when you spoke about the strength of capital and the strength of labor being arraigned against the farming interests.

Before I start, I desire to thank you again, Mr. Mayor, and the citizens of this beautiful city of Chico, for the many courtesies you have already extended during the two days of the County Horticultural Commissioners' Convention, and which you are now extending to the Fruit Growers of the state. (*Applause.*)

(*Mr. Hecke then read the following address.*)

OPENING ADDRESS, FIFTY-SECOND STATE FRUIT GROWERS AND FARMERS' CONVENTION, CHICO, CALIFORNIA, NOVEMBER 12, 1919.

G. H. HECKE, *Director of Agriculture.*

In formally opening the Fifty-second Convention of Fruit Growers and Farmers here at Chico today, I experience the same measure of satisfaction and pleasure as that when the tentative plans announced at Riverside last May pointed to Chico as the next meeting place for these bodies which have contributed so largely to the horticultural and agricultural history of the state.

I feel that we are among those today who are in fullest accord with the object and aims of this memorable gathering, and the present conditions make it more necessary than ever that we should enjoy the undivided and unanimous support not only of every farmer, every civic organization, fruit growing and packing associations, but, indeed, of every citizen of the State of California.

My report at Riverside last May practically terminated the work of the office of State Commissioner of Horticulture, the new Department of Agriculture taking over its duties on July 22 last. Much has been accomplished during the lifetime

of the old Horticultural Commission, and all, I am sure, regretted the passing of the old regime.

At the Napa convention in November, 1916, the foundations were laid for an improved standardization act. At the Sacramento convention, in 1917, the main theme was the question of labor conditions, especially those arising by reason of the great war. The immediate result of this condition was an agricultural labor committee directly connected with the State Council of Defense. At the Riverside conventions the organization of the Western Plant Quarantine Board became an accomplished fact and, without doubt, will become in time a valuable asset to the Pacific Coast and adjacent states.

The control of plant pests through the work of the State Insectary of the new department, and the prevention of the introduction of new plant pests through the effective watchfulness of the department's Plant Quarantine Office, the enforcement of the standardization laws, together with the other numerous duties of the Horticultural Commissioner's office, are already matters of record and speak with credit for themselves.

The new Department of Agriculture has an interesting historical background that may well be reviewed briefly with interest. As early as 1909, Mr. Seavey, now a member of the State Board of Control, proposed a revision of the method of administering the agricultural activities of the state, but at that time the project failed to attract sufficient support to effect its passage in the legislature.

A similar program was broached at the State Fruit Growers' Convention at Los Angeles in 1914, and a committee was appointed to prepare a bill that would meet with more generous approval. The committee did its work well and presented a bill to the 1915 legislature which proposed to unify the work of the several agricultural offices under one effective head, to be known as the "Secretary of Agriculture." This bill also died in legislative committee. At the convention in Visalia in November, 1915, I had the opportunity as County Commissioner of Yolo County of discussing this question, and at that time I took the stand that such consolidation should be effected, together with many other legislative changes, which will be mentioned later.

The recent consolidation and the creation of the State Department of Agriculture is now an accomplished fact, due to the strong initiative of Governor Stephens. The result is a unification of the following bureaus, boards and commissions under the direction of the "Director of Agriculture":

Office of the State Commissioner of Horticulture.
Board of Viticultural Commissioners.
Office of State Veterinarian.
State Board of Cattle Protection.
State Dairy Bureau.
The offices administering the Insecticide and Fungicide Act, and the Fertilizer Act.

The Director of Agriculture, appointed by the Governor under the provisions of Assembly Bill No. 1112, thus finds himself engaged in a broader field of work, definitely outlined and clearly established by legislative action. The well defined work, previously carried on by the various agencies before consolidation, will be continued, and notwithstanding the program of making an effective saving over the cost of conducting the former disconnected work, an aggressive campaign is being pursued to make the services of the new organization more and more valuable to the farming interests of the state.

The branches of the work within the department represent the application of the laws of the state for the protection of the different phases of agriculture. These laws are of a regulatory nature, dealing with the inspection service of the plant and animal industries for the purpose of enforcing the standardization of plant and dairy products, the protection of the cattlemen, and preventing the introduction into the state of plant and animal pests and diseases and controlling those that already exist.

The Department of Agriculture is assuming a large responsibility in endeavoring to carry on the work outlined on a budget less, by nearly $40,000, than were the combined resources of the former independent offices—and this in the face of an increased demand for services and the necessity for providing a better living wage to our employees, thus making quite an increase in salary expense.

It is expected to accomplish this and give at least the same efficient service as was given before consolidation. We will endeavor to do it by preventing

overlapping—by combining, for instance, the cattle inspection with the dairy inspection wherever possible, and rodent control with pest control—and by bringing the headquarters of the former commissions, boards, and bureaus together in one building in Sacramento.

The new Department of Agriculture is fully aware of the danger that may come to the state in proceeding in this important police work without adequate personnel or sufficient equipment; but it is hoped that the result of the trial will demonstrate the wisdom of the plan and at the same time convince the next legislature that the equipment and working force of the department must be commensurate with the responsibilities assumed.

Agriculture is by far the largest and most important industry in the State of California. Figures recently prepared show production values for the year 1918 as follows:

Fruit and grape crops	$171,626,000
Field and truck crops	351,400,000
	$523,026,000
Marketable farm animals	$67,696,955
Dairy products	54,428,056
	$122,125,011
Total agricultural and live stock	$645,151,011

The figures of 1919 naturally will exceed the 1918 production estimates by many millions, and at least 15 per cent would be only a very conservative increase.

For further comparison the 1918 production values show—

Minerals	$37,686,072
Oil	127,459,221
Lumber	29,000,000

or that the agricultural production is more than three times as large as these three great industries combined; and it is thus very evident that the great bulk of California's economic wealth accrues to her revenues from agricultural production.

As a logical conclusion it follows that the Department of Agriculture, which is now charged with the protection of such an extensive industry, must expand to meet the heavy demands to be made upon it now, and increasingly in the near future.

The need for adequate assistance for agriculture has been fully recognized by Governor Stephens, who has laid out his agricultural platform in an editorial, "Why We Must Foster Agriculture," which will appear in the October number of the Monthly Bulletin of the Department of Agriculture.

The important aspect of these questions may be gathered from the timely statements included by Governor Stephens as a part of his article:

"Never before in the history of the world has the realization of humanity's utter dependence on the agriculturist been so acute as it is today.

"The critical situation of civilization in these times will be determined as the farmer may succeed in providing food. And it is not alone in the production of eatables that the farmer is important. He is the bulwark of governments and of peace and order.

"I can not point to a more advantageous use of public funds or employment of the energies of the state officials than aiding the farmer to grow more bountiful crops and to protect them until the harvest time."

How, then, may we promote the growth of this Department of Agriculture to realize the maximum benefits at this time? Let us look back upon the proceedings of years ago. It was at fruit growers' conventions that the need and possibility of co-operative marketing organizations were emphasized, and where the ideas materialized which later resulted in the formation of the earlier co-operative associations, which have proved of sterling worth from every viewpoint.

The outgrowth of the co-operative idea has been the organization of growers of practically every kind of farm products and fruit, and this has resulted in placing the individual growers in a position where instead of realizing a loss for their time and work, they have been able to secure at least a reasonable profit.

These co-operative associations represent the greatest development which has come to California agriculture, and as a united body they are in a position gracefully to suggest such needful agricultural legislation and to secure the well-merited attention which their projects justify. Here then are the means by which adequate assistance and necessary protection to the agricultural industry may be secured.

In the past, special attention has been given to questions of labor and capital by our legislatures, and under the extraordinary stress of present conditions, this is the time for agriculture to be accorded its well-deserved and vital consideration. Especially is it timely that these problems be given due consideration and provided for against the coming of the 1921 legislature with its usual complement of progressive agricultural legislation. We feel that these co-operative marketing organizations form the logical bodies from which to secure such needful legislation and that the ideal method of procedure is through the creation of a legislative committee composed of a representative from each of these associations.

The reasons for the formation of a legislative committee may easily be found in the fact that our recent legislatures as a whole have been kindly disposed toward measures fostering progressive agriculture. In the past, however, no concerted effort has ever been made to bring the farmers' case to the attention of the legislature in a unified way. Every agricultural appropriation bill usually has met with opposition through unfortunate misunderstanding. Under such conditions, was it not almost impossible for our law makers to know the great thing to be done in any given case? The very lack of concerted action on the part of the farmers added to the uncertainty of the legislators and inadvertently clouded the merits of the case, and it is through such ill-timed and disconcerted activity that a resulting lack of support was realized in many cases.

Such a committee should approach these legislative questions impartially, and should not be bound to any one state department or to any special organization, but should carefully consider and work for the needs of all concerned. Any features savoring of a political aspect must at once be eliminated for that is not the function of such a body, and there is nothing which will so quickly destroy its effectiveness and purpose. Its members should be men who will be able to attend its meetings with regularity, and to secure this the means should be provided by which the expenses of these members will be paid from a fund created for the purpose of enabling the committee to accomplish effective work.

The attention of this committee then should be turned to a consideration of the various needs, their relative importance and urgency, and some definite and workable plan prepared for presentation to the coming legislature, behind which plan the entire force of all these organizations can be placed.

As suggested at the Visalia convention in 1915, "this legislative committee should be furnished with financial means for employing a trained jurist known to be versed in the systematic arrangement of acts embodying a common subject, and able to express the will of his clients in legal and certain phraseology, and should, if possible, understand the spirit and inspiration that have enabled the fruit growers to protect and conserve their own interests so well in the past by legislative pioneering that, with all its faults, is yet supreme in that line."

Every step taken by the committee would be under the direct control of the organizations that it represents, and its work would be submitted at last to the fruit growers and farmers for approval at the next fruit growers and farmers' convention, and finally to the legislators for enactment. It is certain that such procedure would suggest a proper guide to legislative consideration and one that would command respect and support from all concerned.

In addition, it might even perform the functions of an agricultural grand jury, investigating present methods and the operation of law-enforcing machinery as it relates to agriculture, investigating the uses made of various funds appropriated for the benefit of agriculture, the needs of agricultural industry and thereby preparing for any recommended changes that may be necessary.

To summarize the principal duties of this committee:

First—It must investigate the needs of agriculture and secure concerted and definite action.

Second—It must act impartially, looking always for the opportunity to secure the best legislation regardless of what branches of the state government or individual agencies may be affected.

Third—It must enjoy absolute freedom from politics, and must avoid all reference to political controversies.

This, then, is the all-important and history-making step which the Chico convention may take toward the upbuilding of California agriculture. To my mind this movement bids fair to become one of the most effective steps that could possibly be taken, and is one which will maintain our agricultural industry in its rightful first place as, indeed, no other single step has ever done. As a concrete example of the effectiveness of such measures, we can point to the progress which has been made through unification by the labor union, and we are in sympathy with the labor union in the systematic manner in which they have secured needed legislative attention when necessary.

Let us follow their example in this respect, and by united and concerted action secure that recognition for agriculture which is rightfully ours, and of which we have been deprived these many years.

Given but the necessary tools with which to work—the Department of Agriculture can show results making for a greater and a more comprehensive system of agriculture, both in plant and animal industry, which, after all, is the pivotal point upon which swings our state's exalted position in the industrial world.

The Chairman—I take great pleasure in saying to you that Governor Stephens is taking an increasing interest in the advancement of agriculture, and he has sent a wire to us which I will read. He spoke to me before he left for southern California a week ago, and regretted that previous arrangements made it impossible for him to be with us.

His wire is as follows:

LOS ANGELES, CALIFORNIA, November 11, 1919.

G. H. Hecke, Director Agriculture,
Fruit Growers and Farmers' Convention, Chico.

Regret I can not be present Wednesday. Engagements keep me here. California fruit growers and farmers are the most progressive agriculturists in the world. I hope they will greatly increase production this coming year. Regards to all. WM. D. STEPHENS, *Governor.*

The Chairman—I now have the pleasure of introducing to you a man who formerly was one of the noted deciduous fruit growers of southern California, but who for the last few years has made his home in the northern part of the state. I refer to Mr. Mills. You have heard of Mr. Mills and of that splendid enterprise he has created on the west side of the Sacramento River.

Mr. James Mills will speak to us on California agriculture; its importance; the things which threaten it; the needs for protection.

I am glad to be able to introduce to you Mr. James Mills, of the Mills Orchard Company, Hamilton City. (*Applause.*)

Address of Mr. James Mills.

It was remarked here a little while ago that a great crisis is upon the world. So it is. Many millions of men were taken away from the pursuit of agriculture and the production of food that you need for the nations of the earth during the last five years, because of the tragedy which has been enacted in another land than ours. We have not been able to meet the requirements of the nation. Europe's larder is empty. Europe is without raw materials. We, here, must do great things in order that the larder may be filled and our own kept overflowing as well. And the bulk of it must be done by the farmers of the world.

Agriculture is the most important industry in California, or in the world. We are peculiarly an agricultural people. First in importance is agriculture and all things depend upon the agriculturist. Every industry in the land—practically

every industry—has its corner stone, its foundation, upon the agriculture of the farm, and depends wholly for success upon the fruitful efforts of the farmer.

It is of great importance that we ourselves should recognize that today we shall make a great effort to cause the men who represent us in the legislative halls also to recognize the importance of agriculture. For many things can be done for us who are in agriculture, or as horticultural commissioners, to enable us in a large way to serve our fellow men.

There are many things which threaten our industry. True, through great efforts, we have obtained, already, the best set of legal enactments, the best code, that has been enacted by the legislature of any commonwealth in the world, through the splendid loyalty and the ability of the men who are charged with the enforcement of the legislation that has been placed upon our books. We have the best and the ablest men and the most conscientious that the world has.

Your attention has been called to the threatening of the Japanese; I believe there is another thing even more threatening, the tenant farmer. I was very much impressed with the remarks of the first speaker, when he touched upon the Japanese. Years ago, we could not have harvested our crops in the south without this vigorous element from the Orient. How well they did their work!

I was impressed with his remarks because he called attention to the manner in which they concentrated upon their work. I recall the fact that today many laborers are endeavoring to escape the responsibility that rests upon their shoulders as co-workers with the long-houred hard working farmers.

The Jap is here in many places because we have failed to measure up to the responsibilities of the situation. I feel sure that we shall find a way of answering this problem.

Of recent years I have had associated with me on the ranch, as has also men like Mr. C. C. Teague, Mr. Leffingwell and others, college boys who went from the farm to the college and are coming back to the farm. I see light ahead. Where others fail they step into the breach, and they serve the interests of agriculture in a wonderful way.

We have, as I stated, the best code of laws. We have today laws upon our statute books which, perhaps, can not be improved upon. Men of experience have already tried those and we have after long years of effort succeeded in getting them enacted and placed upon our statute books. It has taken many years to accomplish this thing. For fourteen years we sought to accomplish it in Congress and failed to get it. We failed to get it because we were not united in our demands.

I remember being in Washington some years ago and asking for a hearing on the part of a senator, no less a man than a senator. And he said, "Why should I help you to get a hearing? Why is there not here a large representative body of California farmers to demand of this assembly the laws they need to protect them from pests and diseases?" At that time every pest that was already established in this country was coming in freely and being scattered broadcast. There was the gipsy moth, the brown-tail moth, the white pine blister rust and other pests that were found. He said: "You are not united; how can you expect from the legislative assemblies the attention you need unless you as united bodies demand that which is yours and would come demanding after you were united."

I might mention to you many pests that threaten us or threatened us at that time. We have in California the mealy-bugs and the perpetual prune rot; the yellows disease, diseases pretty nearly of all the colors of the rainbow. We have the cottony cushion scale, and many of the spiders and the white fly. Very little money has been spent looking after parasites. I want to call your attention to this, that very little money is being spent now in searching for parasites, but I want to call your attention to the work that the parasites have done, are doing and will do, if only we can secure the money to send into all corners of the universe and find the parasites that in some way are working too, and will if introduced here help us.

I wonder if I can recall a little saying that a gentleman gave me the other day that will illustrate what I am going to say:

"Great pests there are which have other pests to bother, annoy and fight 'em, those pests have fleas to bother and to fight 'em; those fleas have lesser fleas, and so on *ad infinitum.*" (*Laughter and applause.*) That illustrates in a few words of rhyme what I want to present to you. The cottony cushion scale in the time of Le Long threatened a prosperous industry of this state. It could

not be controlled until the *Vedalia cardinalis* was found in Australia by Koebele and introduced into this state, propagated by the insectary and by the state authorities, and distributed throughout the country. And marvelous to behold that troublesome pest was brought absolutely under control.

You may see it here and there. My boy came to me once to say, "I have found a marvelous thing up in the orchard! what can it be?" "What does it look like, what is the description?" I said, "Forget it. The little *Vedalia* will find it and that will be the end of it."

For a few dollars we sent a man down to Australia who found that which saved us the life of the industry.

And again we sent out and found the *Scutellista cyanea.* I have been told about that. I have been told what is being done by the insectary at Sacramento.

We have found two other parasites for the black scale which has cost millions. We have spent seven to ten million dollars a year in fighting pests and in studying methods of control, and in fumigating these orchards. We have spent ten million dollars a year which has been taken out of the incomes of the farmers in loss of crops, which has amounted to many times ten million dollars.

And again, we have found other parasites which I am told by Mr. Smith, who is in charge of the insectary, and Charley Teague, my friend, promise much for the control of *the black scale.* We have controlled the mealy-bug, absolutely threatening certain sections a few years ago and which, if allowed to spread, would have caused enormous damage.

Now, it behooves us one and all to get behind the authorities that be to secure a larger appropriation, that our men may be sent into all the distant corners of the earth, from China to Thibet, into Mongolia, down through the cities in Central Asia, into British Columbia, into the Argentine, down through Palestine, into other parts of the world, South Africa, and other places where there are great possibilities in this line. So we should cross the sea into the southern states of Australia, into New Zealand and Manchurian ports; and into the Latin republics of South America. So also we should inspect the great orchards of Italy and Spain if we can get appropriations which so far we have failed to secure, to prevent the great damage which is now being caused to our industry and the great loss by these pests and diseases. We should have the expenses provided for fighting the pests and for their control.

Now, I call attention just in passing to the many pests that are elsewhere and which have not been allowed to enter our coasts and to the splendid work that is being done by those who protect us.

I might call attention to the elm leaf beetle which has destroyed the beautiful elms in many places in New England; to the brown-tail moth and the gipsy moth and to the methods which have been taken to control them in a small way in New England. I might mention the potato moth. No potato can be grown where this potato pest does not find its way. It found its way from Texas and the southern states because they have not taken care to protect themselves. Then there is the Mediterranean fruit fly and the Mexican fruit fly which is on our borders.

We recall the fact, which has been stated, that the importation of plants has increased in the last few years, and the plants brought to our shores have increased 180 per cent. And yet we have not been able to increase the efforts that we ought to have increased in like proportions, to prevent infestations from coming across to our shores. Here again, we must make every effort to secure the appropriation necessary to protect the California industry, the agricultural industry, which is so very important in this respect.

I want to call your attention in passing to another matter which has threatened us here. And yet, I can not say it threatens us, but yet the remedy will be found, if it is forced upon us, in our schools.

Only about one-half per cent of our children reach the university. About 5½ per cent of our children have the advantage of a high school education; 93 per cent of our children stop school after going through the grammar grades. The effort that has been put forward by the state has been to increase facilities for higher education. Thus the children representing the 93 per cent of our school children should have facilities to acquire an education higher than the country school and higher than the grades, and they should have a better grade of teachers.

In order to get this they must get together as farmers and see that better teachers are secured and that they have some knowledge of the rudiments of

agriculture which they can give to the children. But you must realize this in all its great importance; you can not have a higher grade of teacher without paying the salary that will secure that higher grade of teacher. We must pay higher salaries to those men and women that are serving us in the greatest and highest capacity, of any men and women who serve this commonwealth, or any commonwealth of this nation.

The duties which rest upon the teachers are of the highest character. In a large way they shape and design the character of our children.

We speak of Americanism; we speak of making our children Americans, why should we all the time have to put stress upon that? Just because we have been the melting pot; just because we have not created this high sense of citizenship; just because we have not secured ability in these schools of ours which is so greatly needed, that there may be brought to our children the inspiration and that they may be shown the splendid inducements of this land, and the possibilities of happiness under our flag; that they may be inspired, each and every one, to look forward in after years to serve in some place the country which brought them such happiness, such liberty, and such possibilities, so that they may each live under his own vine and under his own fig tree with nothing to make him afraid.

We want better schools and to get better schools we must have better teachers. You must pay higher salaries to get better teachers and higher citizenship. A citizenship with the highest sense of duty as citizens is what we want, and in order to get that we must have men and women in our schools, in our grammar schools, who can inspire, who can raise this citizenship of ours to a higher and more splendid height. (*Applause.*)

I plead with you, that you as farmers in every way possible bring about this improvement for these children of ours, the 93 per cent of them; that you provide them with teachers having nobler ideals and pay them higher salaries so that they may discharge this wonderful duty that rests upon them; that this nation may be presented with the citizenship that is needed and this high sense of citizenship.

In this connection, just to revert a moment and encroach on your patience, I want in the matter of salaries to call your attention to another body of men for just a moment, these quarantine officers of ours, should be paid higher salaries. Many of the best of them have been taken from us by other people.

If we expect to keep in our service men who will protect us in the highest ways, we must pay these salaries that are being paid by other industries. Unless we do that we shall suffer. We contribute to the state very largely through our incomes. We have no selfish purposes in asking that the state contribute towards our needs very largely from the funds that we place in its hands.

One other thing: Pure seed. We are trying to get a pure seed law. We failed at first. We were buying soil fertilizer at one time that had no value at all. I remember on one occasion ferreting out an instance where they were selling a fertilizer at $35 a ton that analyzed at $2.50 a ton value. After strenuous efforts we succeeded in getting a fertilizer much below that figure.

All fertilizer manufacturers guarantee their products. Now we know when we buy a ton of fertilizer that there is a certain amount of nitrogen, potash, and phosphoric acid in it which gives it a certain value. When it is not there there will be trouble for the manufacturer.

As to pure seed: I was in a certain commercial seed house a year ago, and they showed me a sample of seed that was being offered to the farmer and the farmer was buying it or was ready to buy that particular one in which there was not 1 per cent of good seed. I saw the test. There is being distributed to the farmer, poor seed. Poor seed means poor crops. Poor crops means a loss of income. Loss of income means less comfort for the farmer and his wife and children and less food for the nations of the world. Good seed means larger crops of a better quality, which will produce good food of a higher quality with a higher heat value and a higher food value. Good seed, better crops; that means greater income, greater comfort and some luxuries to the farmer who produces it. It means better schools, better roads, better teachers, better school buildings, more happiness, more joy in the world. It means more joy for the farmer and joy and happiness for his family, higher education, higher sense of citizenship, and higher service to the nation. This one thing, if we can get it, will bless the farmer

permanently and be of advantage to the worthy grower. We must get together. We must not be refused a pure seed law by the legislature of California in the next assembly. (*Applause.*)

In closing, I would appeal to you as farmers to act upon the suggestion made by the director of agriculture in his opening address, that you do appoint a strong committee representing every branch of agriculture and horticulture in the state, which will give thought to the preparation of laws which will advance our industry and the advantage to our industry will be an advantage to every man who lives in our community, and has his being on this, God's footstool, so that in demanding these things we are not demanding anything of a selfish nature; we are not asking any special privilege. The farmer has never asked for a special privilege. He has labored, he has toiled, as men might have to obtain that wherewith to live and that the earth might produce abundantly; and he has done it intensively.

I appeal to you that you act upon this suggestion and appoint men from the associations who have gathered together the brains of our industry—the orange associations which market the oranges; the others, the raisin, the peach, the prune, the almond, the rice, and other industries which are organized. The men who have done things, they are the men who will be recognized as representing not tens nor hundreds, nor thousands, but tens of thousands of our farmers, making their demands known as reasonably as they may be, and I am sure they will be listened to when they come to our legislative halls. (*Applause.*)

Compton Elk Farm, Chico, California.

City Plaza, Chico, California.

Wednesday, November 12, 1919.

Afternoon Session.

The afternoon session was opened at 1.30 p.m., Mr. James Mills presiding.

The Chairman—Will the gentlemen please come to order.

The first subject for your consideration is "The Accomplishments and Possibilities of Co-operation." The discussion will be started by Mr. George Pierce, President of the California Almond Growers' Association.

Mr. George W. Pierce—MR. CHAIRMAN, LADIES AND GENTLEMEN: I will keep what I have to say within the limits of a very homelike talk about the subject assigned to me.

(*Whereupon Mr. Pierce read the following paper*):

ACCOMPLISHMENTS AND POSSIBILITIES OF CO-OPERATION.

By GEO. W. PIERCE,[1] Davis, California.

To tell of the accomplishments of co-operative work among the agriculturalists of California, would call for a detailed account of the growth, prosperity and development of the state for the last quarter of a century.

Telling the benefits of co-operation could best be accomplished by unearthing some of the account sales of the olden days with their frequent lavish display of red ink, and compare them with present day returns made by any of the co-operative marketing associations.

Co-operation has greatly increased the prospects of a steady remunerative return for time and labor devoted to farming. If there be a difference between a deficit and a profit, between a gain and a loss, that difference represents the benefits secured by co-operation.

If the placing of any agricultural occupation on a substantial and lasting basis be a benefit, co-operation can claim that benefit.

If the elimination of speculation in farm products and the removal of an imposition on both producer and consumer be a benefit, credit that benefit to co-operation.

If it be a benefit to encourage the production and marketing of only the highest grade of farm products, that idea was fostered by our State Horticultural Commission and was carried out through the co-operation of farmers.

If it be a benefit to the farmer to have removed from him the burden and annoyance of marketing his produce, generally done at a great disadvantage, because of his lack of information on marketing conditions, if it be a benefit to have the assistance and advice of expert salesmen, assuring at all times full market value for one's produce, the benefits desired can be secured through co-operation.

Co-operative marketing has long been the dream of the progressive farmer. Its early attempts met with the usual and almost inevitable failures. The necessities of the case, however, demanded that the best thought be brought to bear to develop a workable plan and secure for the producer an equitable net share of his income. There is no other one function of man's activities so closely related to the welfare, development, yes, to the very existence of the human species, as is the calling of agriculture. It is of utmost importance, therefore, that the business be made attractive. To make it attractive it must be profitable to those who follow it. Its importance demands that it be made the most profitable, if possible, of all industries that it may attract numbers to obtain the continually increased output demanded. In times past the speculator and manipulator took the cream from all farm enterprises, leaving the farmer a skimmed product thinner than charity.

When a new era dawned with co-operation as its basic principal, it found the farmer practically a bankrupt and mortgaged to the limit. It found him eking out an existence by placing upon himself and his family physical burdens

[1]President, California Almond Growers' Exchange.

almost up to the limit of endurance. He was the butt of ridicule of the business world. He was the most prolific source of material for the caricature artist. He was, in his poverty, a strong rival for first place with the proverbial church mouse.

We then, as now, heard much of the importance of agriculture. We read of the enviable position of the farmer in long dissertations by authors who knew nothing of the trials and perplexities of the business. Care-free conditions, supposed to exist on the farm, were written up by those who never came in closer touch with the real trials of farm life than that gained through an occasional week-end visit. The farmer of fiction occupied an ideal position, notwithstanding his rough exterior and unpolished manner. He lived in a section abounding with milk and honey and subsisting on the fat of the land. Could you have had a reliable write-up of the conditions of the average farmer of a decade ago, we would have seen a word picture of self-denial and long suffering that would entitled the hero to a place among the saints. Why did he do it? Four short words give a complete answer: To feed the world. On his recompense he merely existed. Everything was taken from him that could be taken, leaving barely enough to keep him in the field as an actual producer.

Fresh air, sunlight and pure water, vouchsafed him by his Creator, were the only things of which the tax gatherers could not dispoil him. They picked his bones bare and left him by the roadside. Was he ever consulted in matters pertaining to the public welfare? Was any serious thought ever given to his needs, his development or even his comfort?

The farmer had, time and again, heard the politician and officeseeker assure him of loyalty and devotion to his interest only to find that in most measures, camouflaged so as to appear to the interests of the producer, there was a legislative bug biding his time to fatten at the expense of the farmer. Such were the conditions surrounding the farmer, in the slough of despond, when he decided to redeem his occupation and benefit himself by co-operation. He was compelled to come to his own relief. He has since gathered up and appropriated enough of the wreckage to convince him that he is entitled to such a percentage of the gross returns of his product as to permit him to have something above the bare necessities of life. It is going to worry his former exploiters to get this notion out of his head. He has divided his legitimate profits with the parasite, without objection, for the last time.

The direct, personal benefits of co-operation, in a material way are so apparent to the farmer, that in general three-fourths or more of the farming community are now direct supporters of the principles of co-operation. All are of necessity benefited. The small fraction of non-cooperating producers is composed of those who either hope to be benefited by the favoritism of the free lance speculator, or who wish to avail themselves, without cost or exertion, of benefits secured by the foresight and business acumen of brother farmers. They play into the hands of our former exploiters, and are the parasites of the second trench back. They are an obstructing element in their particular line of activities, and their business policy gives comfort to their own worst enemies.

In refusing to participate in co-operative work, managed for and solely in the interest of his line of endeavor, he is declining the life-line thrown to lift him clear of the commercial reefs against whose inhospitable sides countless thousands of business barks have been dashed to pieces. Egotism controls the action of the independent, while greed finances his business.

The benefits of co-operation are not confined to participants. The upbuilding and general thriftiness of a section, in which co-operative work is carried on, is assured and is in evidence on every side. It manifests itself in better homes, improved living conditions, better roads, better schools, and better trading facilities in the near-by towns, built up by the increased prosperity due to co-operative work in the community. The state and county are benefited by the increased valuation of the holdings and the greater output of a diversified agriculture. The nation is benefited by a substantial addition, of the most desirable character, to its citizenship.

As a specific example of the accomplishments of co-operative action among producers we cite the case of the California Almond Growers' Exchange. In existence nine years, it has grown to a membership of thirty-two hundred. Annually at date of price setting, the books are closed to applicants for membership to participate in that season's sale. This year the desire to get in later has been so strong that more than two hundred late applications for membership have

been received. While each year the several almond growing sections are canvassed for members, there are always some who decline to become members. The fact that so many came in late this year would seem to indicate that late repentance is caused by unsatisfactory treatment at the hands of the speculator. This latter chap is just as unscrupulous today as twenty years ago. He is held in check today by the co-operative organizations. On each transaction he goes just as far as his tether will permit him. Along this line the organizations have done their part. They are still handicapped by the action of the outside grower, and the future complete success of co-operative selling, which really makes it possible to have anything to sell, must depend upon an educational campaign among independent sellers.

The great bulk of the almonds purchased outside of the Exchange are bought at prices that range from forty to eighty dollars per ton below the prices received by Exchange members for the same grade of almonds. A very few in each locality, late in the season, are paid extreme prices, as a bait to keep the rest in line for the next season's business. This season's experience is convincing many that they have long been imposed upon. They are turning to the Exchange to secure the justice that is denied them in the open market. Give the Exchange a one hundred per cent organization and it will protect the California grower against even the cheapest imported product.

While the Exchange members are preparing in a substantial manner to take care of the almond business in all its branches, securing land, building warehouses, and installing modern machinery, while they are fostering national legislation looking to the benefit of our condition and fighting adverse measures, what is the outside grower doing for the business? While growing and harvesting a crop of almonds is the most important part of the business, it is far from all of it, and the annual expense incurred in trying to make this plain to all the growers is no small burden.

The independent seller, aside from his failure to co-operate, is a detriment to the business. If he could only reduce his status to the zero point, it would be a gain for the industry. As it is, he is a negative quantity that must be overcome by the efforts of some loyal producer before he himself can really begin to build up his organization.

Just what line of argument induces a grower to become so blind to his interests it is difficult to surmise. In the early days of co-operative work, when the organization was not as strong financially as now, it could not pay growers as promptly as they are paid at the present time. This fact was then worked threadbare as an inducement to remain outside. Now it has lost much of its effectiveness because of the practice of the Exchange in paying about fifty per cent of the value of the product on delivery. This is followed by other payments, at short intervals as the crop is moved.

There exists no logical reason for any grower to decline to become a member of a co-operative marketing organization, managed along modern progressive lines. The only excuse such an organization has to offer for its existence is its ability to render service to its members.

It is controlled by a board of directors financially interested in the business. If the policy adopted by this board fails to bring desired results, a new board with new policies may supplant the old within a year. The management is in the hands of a salaried officer who must make good or retire. The organization in every branch of its activities is directly under the control of the producer. If, under this arrangement, one can not obtain satisfactory service, he is doomed to disappointment for the remainder of his days.

The co-operative organization gives service through a score of avenues. Any cost of upkeep is returned many times over by benefits received. These come to us at such frequent intervals and often in such unexpected ways that we are wont to overlook many of them. In time of adverstiy, when disaster, in some of its many forms, overtakes your industry as it is almost certain to do, you need the strength that numbers and experience can give. To minimize the effects of disaster, preparation in advance is necessary. The most effective safeguard yet devised by man for the protection of any given industry is a live co-operative association of parties interested in the success of the enterprise.

As producers we owe it to our customers, the consumers of our output, that they be relieved of all unnecessary burdens and expense. It is not only our *duty* to do this, but it is, but it is *good business*. It will increase consumption

and insure a steady demand. Under ruling conditions the consumer pays for transportation, distribution and possibly some graft or extortionate charges made somewhere along the line of travel. He is frequently forced to pay one hundred per cent or more over the price the producer receives. Good returns, that, on capital invested but a few hours. It goes without saying that this is unjust both to producer and consumer. Many of these charges for a passing service are too high. Some of them should be eliminated wholly. The consumer justly complains. He charges up all of the high cost of living to the producer, when, as a matter of fact, only *in one-half of this charge* does the producer participate in any way. Naturally, under this view of the matter the producer is termed a profiteer. Consumption falls off and ill feeling is engendered.

The producer should extend his field of operations so as to control, or at least regulate delivery. This is possible under co-operative management. We have retired the speculator. Let us now turn the light of day on the petty grafter and make him a thing of the past in so far as the marketing of our produce is concerned. With a firm hand on the marketing end of our several lines we can free ourselves from the suspicion that now exists, that we are profiteers. That this suspicion exists, there is no doubt, and our apathy in the matter adds converts to the belief.

Within the last month a call was issued to the mayors of 145 cities of the Pacific Coast, to convene in Sacramento with the avowed purpose of formulating a plan for boycotting certain farm products. These official representatives earnestly discussed and favored the enactment of such laws as would put every co-operative selling organization in the state out of business. They invited chaos. They even went so far as to petition Governor Stephens to convene the legislature in special session for immediate action on the proposed measures. Had this scheme worked to a successful finish, what would it have meant to the producing classes?

It is easy to predict what it would have done to the city. Had the proposed boycott extended to *all farm products,* and had that boycott been religiously observed for a period of thirty days, *we know* that we would have lost for all time, 145 customers, for this self-imposed famine would in that time or less, have scored a record of 100 per cent.

Here is a pressing two-fold demand for immediate co-operative action among producers. First, its mission is humanitarian, as it is called upon to aid in preventing starvation in the city, the possible outcome of the city's own visionary theorists. From a commercial standpoint it must preserve the city as a necessary outlet for our ever-increasing farm products.

At the mayoralty gathering referred to, only two producers' organizations were represented, and that representation was accidental. It was proposed to close the market for three-quarters of a billion dollars' worth of annual farm farm products in California. Back of these enormous accumulations, representing, as they did, the sole income and dependence of our entire farming population, came a mere chance defense. Luck, rather than foresight, saved the day. It so happened that our able and active State Market Director, Colonel Harris Weinstock, dropped in at the meeting. In his forceful manner he did much to help defeat the pernicious measure.

This attempt to make us responsible for the sins of others has been temporarily tabled, but at the next session of the legislature, if we mistake not, this measure will be revived with conditions more drastic, if possible, than those contained in the original. Are we, as representatives of the producers, going to be prepared at that time to make adequate defense? Can we afford to let so important a matter drift, to be taken care of by a chance defense?

Beside this defense, and possibly more, there will be much constructive work needed at each recurring session of the legislature. To successfully meet this we should have a central representative body composed of delegates from each organization connected in any way with the production, handling or marketing of California-grown food products. The findings of this body should be cared for, and our interests furthered by one or more persons skilled in legislative procedure.

It is a trite saying that the farmer does not realize his strength. Co-operative methods are fast revealing the secret. It is now on the tongue of every progressive farmer. The power and possibilities revealed to date, are greater than

the most enthusiastic had ever anticipated. We can not justly take unto ourselves, however, the credit for having solved the problem. Union labor did that, and applied the newly gained information for its own benefit in so vigorous a manner that in self defense we have been compelled to adapt the formula.

Union labor, our instructor, is burdened by the possibilities revealed. It can not judiciously use the vast fund at its disposal. But this is no cause for wonderment. Suddenly acquired riches are frequently misspent. The child does not over-eat confectionery because it wants to be sick, but because it likes the candy.

The attempt to openly defy our government, now being tried by union labor, is ill-advised. Our instructor is showing us by example what we ought *not* to do. He is working out the proper status of this new governmental factor. Experiments are frequently expensive, and sometimes disastrous. Our position at this time is extremely fortunate. We have the same opportunities as those enjoyed by our instructor. We are in a position to get more out of them than is he. While he is placing warning signs at pitfalls and dangerous crossings, he has no more interested onlooker than the farmer. As certain as fate, we are going to use the power he is now developing. It is to be hoped that we can inject into it an adult dose of respect for the rights of others. He has cited mistakes galore for us to shun.

While we are learning our capabilities, we must also learn our limitations. When the pioneering work is over, and all are compelled to recognize that ours is a government of right, not of might, we will file on as much of the newly developed power as may be necessary, not to oppress, but to protect.

The Chairman—Mr. Pierce in his able address has furnished you with much food for thought. Think it over while the discussion proceeds.

Mr. F. A. Seymour, Fresno, California, of the California Raisin Growers' Association, will continue the discussion.

I have great pleasure in introducing to you the representative of an association which has done marvels for the raisin growers.

Mr. F. A. Seymour—Mr. Chairman, Ladies and Gentlemen:

Mr. Giffen wished me to express to you his sincere regrets for his inability to be with you on this occasion. He had planned on being here, but has been summoned to appear in Washington before the Federal Trade Commission to satisfy that body that the prices named on raisins for the 1919 crop by the Association are fair and reasonable. To those of you who do not know Mr. Giffen let me say that you have missed something worth while in not hearing him because when he talks he always says something. Mr. Giffen is the real reason for the success of the Raisin Association.

I am offering no apologies for trying to take his place, but being well acquainted with both parties will admit that you have my sympathy.

(*Whereupon the following paper was read by Mr. Seymour*):

THE SUCCESS OF THE CALIFORNIA RAISIN GROWERS' ASSOCIATION.

By F. A. Seymour, Fresno, California.

Were you to ask any resident of the San Joaquin Valley from Bakersfield to Modesto what he thinks of co-operative marketing of farm products you would surely regret the question if you were in a hurry, because he would have so much to tell you of the benefits and advantages of this system that it would make you late for dinner to hear him out. Now, do not get nervous because I promise, for special reasons, not to interfere with your dinner.

There were eight firms of commercial packers who absolutely controlled the selling and distribution of the raisin crop, and for years the grower was kicked about among them with pleasure and profit to all but himself.

Several efforts were made to be free from this unfortunate situation, but each in turn failed until the present Association was organized. The idea that

co-operation was the solution was ever present, but the previous methods of applying it were faulty—principally in that they provided no funds with which to operate and it is not practical to handle a business of from twenty to forty million dollars a year without money. Our sales of the 1919 crop will amount to about forty million dollars.

Successful emancipation from the packers' clutches came in 1912 with the organization of this Association, at which time a million dollars was subscribed, most of it by growers, but augmented by bankers and business houses, as a capital with which to operate. The greed and lack of foresight of the packer killed his goose that laid the golden egg. He failed to appreciate the fact that every road must have an end, and to see that some day the long suffering grower would refuse to contribute further to his prosperity while the grower's mortgage grew larger each year. The raisin business in the hands of the packer was purely speculative, and since most men have a leaning toward speculation and taking a chance the grower might have been more or less satisfied had he been permitted to participate in the gamble. But he had no part in it. He furnished the land and the labor and carried the mortgage, and while he was doing all this the merry game was being played by the packers, who did not always win—sometimes they lost—but the grower never won. Year after year he did not get enough for his crop to pay the cost of production. The law of supply and demand generally supposed to control prices had no chance against the law of the packers, which was supreme. The market was manipulated by him in his own interest and always to the detriment of the grower. When the crop was harvested and most of the growers needed money it was necessary for them to sell, and with the majority trying to sell at the same time to a few buyers who were in complete control the inevitable result was demoralization of the market and the hammering of prices to the starvation point. The average of the crop for the five years previous to the organization of the Association was 70,000 tons, and each year there was a carry-over and it was necessary to sell a portion of the crop to the distilleries, so that it was generally believed that there was an overproduction of raisins and some growers were digging up their vines. Subsequent events have proved that there was not an overproduction and that the fault lay in the method of selling and distribution.

Almost the first act of the Association after organization was the purchase of 25,000 tons of surplus from the 1912 crop, in order to prevent demoralization of the market. This was bought at a cent a pound higher than the packers were offering at that time.

Since that time the entire crop has been sold each year before the following one was harvested, and in spite of the fact that the tonnage has increased enormously. The 1918 crop was 163,000 tons and the 1919 crop is estimated at about 175,000 tons. The estimate of the latter crop earlier in the season was 200,000 tons, since reduced by the extreme heat during the ripening season, and also by the lack of irrigation water.

We will not go into the difficulties overcome in securing stock subscriptions and contracts with growers, which looked almost insurmountable at times. The fact remains that the organization was effected and proceeded to prove its worth.

A contract was made with growers representing over 75 per cent of the raisin acreage under which they were to cure and deliver their crops to the Association, receiving therefor 3¼ cents per pound for Muscats and 3½ cents for Thompsons at the time of delivery. After the raisins were disposed of the Association was to pay the grower any further sums realized above the initial payment after deducting packing and handling costs, etc. At that time the prices paid on delivery were considered fairly good so that any further payments that should be made would be that much more than was actually expected by the grower. Each year there has been an additional payment varying from $6.20 per ton on Muscats, which was the lowest, to $30 for the 1917 crop; 1918 crop figures not yet available.

The contracts with the growers expired with the 1917 crop so that it was necessary to secure signatures to a new contract which was done during the winter and spring of 1917-18 in a whirlwind campaign which proved the loyalty and faith in co-operation of the entire valley. Toward the end of the campaign, banks, business houses of all kinds and men of every profession closed their doors and devoted a day to securing contracts from the growers. When the result was ascertained it was found that approximately 90 per cent of the entire

acreage was signed up on a contract much more binding than the previous one had been.

After five years' trial of this method of marketing a renewal of 90 per cent of a largely increased acreage for another six years seems the strongest possible argument in favor of co-operation from the whole community. All had not been smooth sailing during this five-year period. The independent packers have used every possible means to disrupt the organization. They have tried to convince the growers that general trade conditions and not co-operation were responsible for cleaning up the crop each year and the more prosperous times, and toward the end of each season they have bought a few crops at prices in excess of those paid by the Association, hoping to make the loyal grower dissatisfied. So far their efforts have failed—all the growers, whether inside or out, are strong for the Association. There were instances during our last campaign of growers very earnestly and actively soliciting contracts for the Association who finally failed to sign up themselves. They realized that the Association must be preserved, but preferred to remain outside with the hope of getting a little more for their crop than the Association might pay.

There are two reasons for the increased demand—the first is national advertising, which was commenced in 1914; and the second is the fact that the opening price has always been guaranteed against decline until January following and the trade has learned that the guarantee means something and that they are buying an article stabilized in price and quality—that there is no gamble when their order is placed at the beginning of the season. In 1914 at the beginning of the advertising campaign the sales of bulk seeded Muscats in 25-pound boxes, which are used almost exclusively by bakers for bread and pies, amounted to 62,573 boxes, the following year they were 583,834, in 1916 1,050,194, about the same in 1917, and 1,565,938 in 1918.

When advertising was commenced the 2-crown raisin, which is the one used in the bulk seeded, was the problem—what could be done with it—only a limited amount seemed to be required for the carton trade, and the bakers took so little as to make no impression on the balance. The results of the advertising were so definite and immediate that now our problem is to get enough raisins to go around. When the Association commenced operations it was without packing houses and facilities for handling the crop. Contracts were made with independent packers under which they received, packed, stored and shipped the raisins. They also sold raisins for the Association. A few packing houses were purchased outright and operated by the Association. At the time of expiration of the first growers' contract, the packing and selling contracts with independent packers also expired and these were not renewed. New and modern packing houses have been built and equipped at points in the valley where required at an expenditure of about $3,000,000.

We have also built a reinforced concrete seeding and drying plant at Fresno where most of the Muscats for seeding are concentrated. This plant is located on a 20-acre tract in the eastern part of the city. It is served by tracks from both the Southern Pacific and Santa Fe and is modern in every particular. The up-to-date methods of handling the raisins will result in a saving of two to three dollars per ton on every ton packed. The plant has a capacity of 350 tons of seeded raisins and 150 tons of seedless, a total of 500 tons per day of eight hours. We have an investment in this plant of about $1,677,000, and are operating throughout the valley 35 packing plants.

These plants have a packing and shipping capacity of 1500 tons per day. We have during the height of the present season been receiving from growers at the rate of 4,500 tons per day, which means the paying out of $450,000 per day. We have paid the growers $100 per ton on delivery this year, though the contract provides for the payment of only $70.

Planting of new vineyards is going on at a rate which is almost unbelievable. By the time our present contract expires—1923—we expect to be handling 225,000 tons of raisins. We have no fear for the industry as long as we have an Association. We expect to increase the consumption very materially in this country, and we have already started a campaign of education as to the uses and food value of the raisin in Japan and China. We expect to develop a market in the Orient which will take care of any possible surplus that may ever be produced in this country.

Could there be a stronger argument in favor of co-operation? Compare these two pictures—here was a beautiful and fertile valley in the center of a wonderful

state producing 70,000 tons of raisins per year at an actual loss to the producers; they were struggling to pay the interest on their mortgages—some were digging out their vines and others were willing to sell out at any price, and now we see the same valley seven years later producing 200,000 tons of raisins, smiling with prosperity, having forgotten the debts and the struggles that went with them and planting new vineyards at the rate of 10,000 acres per year, and making two blades grow where only one grew before.

The Chairman—We have a man who will now continue the discussion whom we have known long and familiarly under the name of Frank. He is the man who maketh the pear growers sweat. (*Laughter.*)

I have pleasure in introducing to you Mr. Frank T. Swett, Martinez, of the California Pear Growers' Association. (*Applause.*)

Mr. Frank T. Swett—MR. CHAIRMAN, LADIES AND GENTLEMEN, FELLOW PEAR GROWERS AND THOSE WHO ARE NOT INTERESTED IN PEARS: My excuse for giving a somewhat lengthy dissertation on pears and pear co-operation is that there are many other growers who are still unorganized who, perhaps, will be interested.

If you grow cherries that are sold for canning purposes, if you grow plums, if you grow apricots that are sold in a fresh state, if you grow asparagus, why, perhaps, some of the details of the history of our little organization may be of use to you.

As I sat there listening to the history of a grown-up organization I could not help feeling the contrast.

The Raisin Association has grown up, to a certain extent. The Pear Association is a little eighteen-months-old infant. Why, we have not learned to talk yet—by that, I mean that we hope some day—because we know we will have to—we hope to talk to the consumer of the United States by national advertising.

When the product of pears in California grows from a business of 100,000 tons to the future of 300,000 tons some talking has got to be done, some advertising, some information given whereby the nation will recognize the voice of the Growers' Association.

I have put my talk in the form of an alleged interview for the purpose of bringing out certain things that are of popular interest at the present time.

(*Whereupon Mr. Swett read the following paper*):

"SIXTY CENTS A CAN FOR BARTLETT PEARS!"

By FRANK T. SWETT,[1] Martinez, California.

"Sixty cents for a can of Bartlett pears. Good night!" So said Jones to the grocery clerk. "What's the idea? I used to buy the same brand for thirty."

Jones is a successful business man of San Francisco. Mrs. Jones has 'phoned his office that afternoon, "Company for supper; we haven't a bit of fruit in the apartment; it's too late to order; now, Dearie, call in at Goldberg-Bowen grocery and bring home a can of nice Bartlett pears."

Jones is a man who wants to be shown. He asked the clerk "What's the reason of this raise?"

"Why, Mr. Jones, don't you read the papers? Senator Browne of Los Angeles, Mrs. Cleverdon of Berkeley, Secretary Connelly of the Grocers' Association, and a whole bunch of mayors are agreed that the farmers are profiteering on us city guys; and wicked Weinstock has organized them into terrible trusts to sting the consumer!"

[1] California Pear Growers' Association.

"*Believe* me," said Jones, "I'm going to investigate," as he jumped into his Pierce-Arrow and sped home to the apartment.

The next day he talked with a banker on that painfully popular theme, High Cost of Living.

"Inflated currency, diminishing dollar, excessive demand for all foods, restricted production of commodities due to the strike habit—the customary aftermath of all big wars," said the banker. "Mark Sullivan said it in Colliers Weekly in his remark that 'the dollar should be renamed and designated a "dollarette."' We're all trading in fifty-cent dollars. Now, Jones, your sixty-cent can of pears is really a merely old-fashioned thirty cents.

"This is too abstract for me," said Jones. So he asked a prominent canner who recently announced in a financial letter to the press that canners had all made phenominal profits this season; but now that it had all been sold the price was really too high and that the remedy next year would be to pay the fruit growers less for their fruit. "Growers must not expect such exorbitant prices next season." The canner told Jones all about higher cannery labor costs, etc., but said nothing about higher costs on the farm.

But Jones was thorough. He had been told at second-hand, about farmers' combinations. He wanted to beard one in its den. He bravely ventured into the office of the Pear Growers' Association.

The retailer had passed the buck to the "farmers' combine"; the canner had followed suit. The mayor and supervisors of the city that presents gold plates to the Irish president had emphatically berated the far-off farmer. Was this solution correct?

Secretary Hamilton was at his desk. Said Jones, "I'm going to ask some important questions. While I'm making double the money I used to, it takes it about all to live comfortably. Shoes, clothes, nurses, housemaids, rent, theater tickets, all have gone up; and it's most aggravating to have to pay more for food."

"Why did the grocer charge me sixty cents for those pears? Why don't your Association sell the fruit cheaper to the canner? I'm afraid the growers are profiteering. Defend yourself if you can!"

"All right," said the secretary. "Let's analyze your sixty cents." "When you paid, you laid on the counter a four-bit piece and a dime. What did the grower get from the four-bit piece? Not one penny! The grower got the dime. Out of that dime he paid for a whole year's work in the orchard, taxes, irrigation, spraying, plowing, tractors, compensation insurance, spray materials, distillate, housing for employees.

"The owner and his family lived and worked on only four pennies of your dime. Six cents he paid out for employees and orchard expense.

"If the philanthropic grower could afford to work for nothing and board himself, then pears might sell four cents cheaper, or fifty-six cents. Now, Mr. Jones, if you are looking for profiteering, will you seek it in the grower's four cents, or in the other fifty-six cents? Without your dime, production would stop short."

"You surprise me," responded Jones. "I can hardly credit your data."

"Here are the facts," said Hamilton. "The Association sold 14,000 tons to canners at $85 a ton. A ton will make from 37 to 40 cases of canned pears, or considerably more than 850 cans. At 10 cents a can this is $85.

"The deuce you say," said Jones. "I don't begrudge the dime, for I realize the production must continue. But where did my four bits go?

"That went for canners' boxes, freight, stevedores, deck hands, coal miners, oil men, draymen, cold storage in cannery, wages that are three times as high as formerly, in high freight rates on sugar, perhaps hauled in the ships that made Mayor Rolph a millionaire, for tin and labels and cannery cases, higher wages in lumber camps, rent, clerk hire and delivery for the retailer.

"The canner sold the case of 24 cans for $8.50. When retailed the same case cost consumers $14.40. Each can carried a burden of 25 cents in its trip from the canner's warehouse to the consumer, or a total of $6. When the grocer took your can from the shelf and handed it over the counter, his 20 per cent earned in two minutes, cost you twelve cents, more than the original grower's price on the pears."

"Robbers," said Jones. "Wait," said Hamilton, "doesn't Mrs. Jones usually telephone the store and have goods delivered way out at your apartment and

charged? The grocer's price is set according to *customary* expense and not by the exceptional occasions when patrons pay cash and carry home. The grocer is lucky if he nets 4 per cent after all expenses are paid."

"Just one more question," said Jones. "How about the expense of this Association; isn't it just one more expense between producer and consumer? What does this cost, and who pays it?"

"It came out of your dime," said Hamilton. "In 1919 the business of 450 growers, producing about half the pears of California, was handled at an average cost, not of 20 per cent, not of 10 per cent, nor of 5 per cent; but the almost microscopic and infinitesmally small charge of 2/3 of 1 per cent on the growers' whole output.

"Canners used to have scores of buyers in the field at an expense of $1.50 to $2.50 a ton for the fruit purchased. This needless expense is practically eliminated. One man, the manager of the Association, does all the selling, at minimum expense.

"And furthermore, out of the Association charge to growers of ninety cents a ton on the cannery pears, there is provision for inspection, shipment, billing, collection, and remitting the grower, and included also adequate financial insurance. This is credit indemnity insurance. Should a cannery fail to pay the Association, the American Credit Indemnity Company pays, just like fire insurance."

"You astonish me," said Jones. "How do you get by so cheap?"

"Because this is modern, scientific, co-operative marketing. We have had the assistance in organizing of a man who is one of California's most successful merchants, a man who has studied marketing the world over, a man who has done more to encourage food production and to stimulate California agriculture than all others put together—State Market Commissioner, Colonel Weinstock."

"But don't associations stifle competition?"

"On the contrary, they encourage competition of a new kind—constructive, not destructive. Speculation is lessened or eliminated. The grower encouraged, bends every energy in competing with his neighbors for better quality and increased production. New fields and orchard lands are cleared and planted. You consumers want more to eat. Better methods mean better crops. Better spraying and cultivating means better quality. Maximum production means reasonable prices.

"This Association has directors' meetings monthly. In winter and spring these meetings are held in the different fruit districts. Growers attend; last week 69 growers of Santa Rosa met our directors from other sections and a day was spent in planning, with the assistance of scientific experts, better cultivation and spraying methods. This means increased production of better fruit for you, Mr. Consumer.

"In a few years, California, instead of 100,000 tons of pears, will produce 300,000 tons. Does that sound good to you?

"Have we hampered canning and drying by Association prices? No. This season the greatest pack of pears on record, over 30,000 tons, was canned. Twice the usual tonnage was dried. Practically none went to waste.

"The smallest canner can buy his little supply, perhaps only 40 tons, at the same price and of the same quality as the buyer who buys 5000 tons. Does this encourage him to put up a full pack? I guess yes.

"One canner, who had ordered 400 tons before we named a price, upon being notified of the price on June 2, came to the office the next day. 'Increase my order to 900 tons—your price is reasonable, and we are going to strain every effort to put up a larger pack than ever before.'

"We marketed this year $1,100,000 of pears, without the loss of one cent in bad accounts. Canners have dealt with us squarely and honorably.

"We have stabilized the Eastern markets for fresh pears by diverting the surplus, which formerly used to bring about a regular disastrous slump in August, to driers and canners.

"We are a group of 450 growers pulling harmoniously together, trying to serve faithfully both producer, manufacturer, and consumer. We've made a good beginning in our first two years. We can do more and better work in future years. Other growers' associations are working along similar lines."

"I'm glad I called," said Jones. "Next time I hear earnest but misguided and ignorant politicians roasting the producer and his marketing associations I'll call his bluff and demand less eloquence but more facts."

And he departed, feeling better.

The Chairman—Mr. A. E. Sunderland, Fresno, California, of the Peach Growers' Association, will now address you.

Mr. A. E. Sunderland—MR. CHAIRMAN, LADIES AND GENTLEMEN: Mr. Frank H. Wilson, our president, desired me to express to this audience his regret at not being able to be present. He goes to Washington with Mr. White and Mr. Niswander, vice president and manager of our association, respectively, and I have come in his place. At the last moment he learned about this trip and found it was impossible for him to come and so as his poor substitute I was sent instead.

I feel right now, Mr. Chairman, like a very thin sandwich, following that wonderful paper just read and coming after me the wonderful talk that you have come to hear, according to the program, from Mr. Powell who follows me; I feel like a cheese sandwich. I am sure it is impossible to interest you anything like as much as either of those two gentlemen.

Another thing: The ones who have preceded me have told you practically all there is to tell about this wondeful story of co-operation. The co-operative societies throughout this state are the organizations, if you want to know, who took the speck out of speculation. (*Laughter.*) There is no question about that. If you don't believe it ask our friends, the outsiders; the outside packers particularly. Ask them if co-operative associations are any good and if they are not a menace. The outside interests have made all this noise which is being raised by the Federal Trade Commission in Washington. The attorney who represents them raised the noise for the outside packer. He does not belong to the Raisin Association. Some others who are helping him are, I believe, really the ones who started the outside packers.

Now what the dickens would anybody, any of those fellows care about what co-operative societies are doing or will do if they were not hurting their business, if they are not a benefit to the ones that should be benefited—and that is, to you?

These stories that you have just had presented to you about what co-operation has done in the past six or seven years are actual realities, and the peach growers whom I have the pleasure of representing are no exception.

(*Whereupon Mr. Sunderland read the following paper*):

THE CALIFORNIA PEACH GROWERS' ASSOCIATION.

By A. E. SUNDERLAND, Fresno, California.

In the spring of 1916 is when we started the organization. We were incorporated in January, 1916, January 25, and we actually went into operation in May of that year, and the highest price that had been put for the 1915 crop of dried peaches to the grower was two and three-fourth cents.

At the time we organized there was some three or four thousand tons of those peaches, 1915 crop, to carry over, which they positively could not sell at any price. We took over a small pool of some forty or fifty growers having fifteen hundred tons in one district. They had gotten together and agreed on a scheme, either to get nothing for them or to get half-way acceptable prices.

We took those peaches over and sold them and netted to the growers five and one-fourth cents per pound.

That was the first year of the crop of the peach growers. And the same year on the same crop we got the growers six cents a pound for 1916 crop in the year 1917.

The largest crop in the history of the peach-growing industry in California, dried peaches, was a forty-thousand-ton crop, which we netted to the growers eight dollars and thirty-two cents. In 1918 the price was eleven cents. In 1919 it is too early to estimate, but under our form of contract the final statement to the grower is based on actual deliveries and that price can not be set until the peaches are all sold and shipped and I will say that the price is considerably higher than it was last year.

The peaches are all sold and have been for a long time, and you will believe it, I know, because I am telling you (laughter); but if you are interested you will hardly believe me when I say that we actually confirmed less than fifty per cent of the orders that were tendered us by the jobbers of the United States for shipment this year. We could not accept them because we did not and will not have the peaches. We accepted less than fifty per cent, and this year's crop, let me tell you, is not going to be a very small crop.

As near as we could figure, there will be a thirty-five-thousand-ton crop, one of the largest crops in the history of California for dried peaches. And in the face of that, only four years ago a small crop could not be marketed for two and three-fourths cents per pound, and today we are refusing to accept over fifty per cent of the orders that have been handed to us.

Now, surely, people, you don't believe that condition of affairs exists because of any aid from the commercial packers, do you?

We should work in co-operation through co-operative organizations which are here to stay. Why, if you just stop to think of it, this is a world condition that nobody can control and no single organization of producers can block them. Everything is high and everybody is trying to pass the buck, as it were.

The retail grocers at their meeting not long ago in Fresno tried to help it along to somebody else; they tried to pass it up to the Association, arguing they were not to blame for the high cost of living. I think the paper just read more truly and clearly pictures who is to blame than any argument I might make for the next two hours. Don't get scared; I won't talk that long.

It reminds me of a fellow who went into a restaurant. He picked up the bill of fare and the waiter stood and waited for him. "Good gracious," he said, "Ye Gods! Eggs fifteen cents apiece! Robbery!" "What is it?" asked the waiter. "Have you a fit? I am no hen. I am not to blame for this." (*Laughter.*)

There are all kinds of situations which remind me of that. That is about all we can do. It doesn't make any difference, we've got to "holler" like that man did. We must "holler" at somebody. The first fellow we "holler" at is the producer. That is natural. He is "hollered" at just as if he had no business to be a producer. If people starve a little while maybe they will shut up some of the "hollering." (*Laughter and applause.*)

Now, I take it the crowd before me is composed of farmers. You all look like it. A farmer is a man or a woman who lives on a farm and who strives from day to day intelligently to produce the product that he or she has on the farm. He tries to learn more and more each year about perfection in farming and in producing standard crops. That is a farmer. An agriculturist is a fellow who owns a ranch and lives in town and doesn't know a darned thing about the farm and never will. He is an agriculturist. (*Laughter.*) He makes more noise usually and causes more trouble and kicks more about co-operative associations than anybody else because he doesn't know anything about them. (*Laughter.*)

I presume you have got some agriculturists here in your community. Most communities have them. My advice to you is to try to educate these fellows; try to get them to the point where they will know something about what co-operative organization means; these associations that are doing so much for the real farmer. I dare say if they are in this community as they are in most communities you have some job on your hands to educate them.

As a matter of fact, these fellows, the agriculturists, the big farmers—and an agriculturist always is a big farmer—are harder to convince that co-operation is the best thing for his interests as a producer than any of your men and women who actually know what it is to farm. It is harder to convince such a man.

I have had them tell me during the time of organization before we were completely organized, when we were holding meetings at the schoolhouse or at the four corners, everywhere, I have had those agriculturists actually tell me: "I don't think I need anybody to run my business. I think I can do that." Now, you have to educate those people who have that opinion, that they should try to better the conditions of the producer. And in that, as I say, it is very hard sometimes to educate them; it is impossible to educate some of them on that line.

There never will be a time when co-operative organizations will be one hundred per cent strong. It never will happen. It is a big question.

It reminds me of a story of a lady who took exception to what the preacher was saying. She went to church and heard the preacher discourse and he called attention to the fact that the Bible did not reveal anywhere that woman was perfect. He dwelt upon that for quite a little while. Pretty soon a lady in the back part of the room got up and said: "Reverend, I would like to take exception to your statement just now. I have known for several years of one woman that was absolutely perfect." "Well," said the preacher, "madam, I can assure you I would like to know who that woman was. I am glad of your courage." The woman replied: "My husband's first wife." (*Laughter.*)

At any time—I do not believe in the history of the world that this organization is going to be perfect or that any co-operative organization is going to be perfect, because we are progressive. The idea of co-operative marketing organizations, the idea itself, is a progressive thought. We are making progress and for that reason we can not expect to ever reach the point where we will be one hundred per cent perfect. But we are making vast strides towards perfection. The thing that is going to do more towards making any and all of our co-operative organizations perfect is membership. The members must be staunch and true to their organization, whatever it may be. The pear growers, the raisin growers, the walnut growers, the honey growers, the olive growers and the peach growers, to get the best results, to bring about such conditions as may be near perfection must be through the membership itself. The members must be worthy and proud of their organization.

I do not believe there is a person in this room today but what firmly believes deep down in his or her heart that a co-operative marketing organization is the best thing for the producer. Why, I even believe those fellows—I hope there are none present here; well, I don't care if there are; it is probably better if there are some of them present—I really believe that those fellows who belong to these co-operative organizations who did not live up to the terms of the contract with their own society this year and sold to an outside packer—deep down in their hearts they know they did wrong.

I can not help getting a little excited when I think of that kind of fellows. That actually happened. It actually happened in this very district of Chico with the Peach Growers' Association. There are three things that are positive; it did happen; it did happen here; it did happen with a member of the Peach Growers' Association.

If any of those people are present, they know and I know all about it. It is just such things as that, ladies and gentlemen, that must be overcome. For a few paltry dollars, don't throw down your own organization even for one year and fail to deliver your crops to it. Help your organization to become one hundred per cent perfect by delivering every pound that you contract for. That is the thing that will make co-operative organizations a rock of Gibraltar in the years to come in California.

Our president, who I am sorry could not come here, because he is one of the strong packers and you would certainly have enjoyed listening to him today—made a statement the other day that I think was very apropos in connection with co-operative societies.

"I don't see," he said, "how anybody can argue against it. All they have got to do is to stop and think about a few years ago when there was no co-operative organization. Everything was handled commercially and the growers' products were used like so many poker chips in those days." Isn't that true? "They were used just like so many poker chips. It could not be otherwise."

You all know that you sold your peaches, your prunes and your apricots to the packers as early in the year as February when none of you could be bound to anything because you did not know what kind of a year it was going to be for your trees. But you contracted because the outside buyers came around and offered to contract with you. That was nothing but speculation. The

packer could not buy that which did not exist. He could not do that with any degree of safety, nor could you. He was simply speculating with the grower's crops; using them, as Frank Wilson said, as so many poker chips.

Now, that is one thing that is absolutely eliminated with the advent of the co-operative organizations. There is no speculation of that kind. In fact, we have a lot of kicks—not so many this year as formerly, but we did have a lot of kicks from the jobbers because we did not name prices earlier in the season. We did not go out and name prices in February, March, and April as they had been accustomed to in the old commercial days. We will not name prices until the season is far enough advanced that we can obtain some intelligent idea of what the size of the crop is going to be; so that we can estimate the product of dried peaches we are going to have to sell. We want to know that before we make the price, because, after all, a good deal depends on supply and demand.

If we have a very small supply and even the normal demand, it is not going to go around. If we have a large supply it stands to reason that a large crop, or supply, may be as large, and possibly larger, than the demand, and we can not expect quite so much for that as we would for the smaller crop. But those things can not be determined until we have some idea what the crop is going to be.

That is the line we work on. That is the line for all of the co-operative organizations to insist upon working to if they are going to do the best they can for the producer; that is the way it will be done.

I think Mr. Seymore in his address touched upon that subject as well. He showed how we marketed the product. He showed that there were from ten to two hundred thousand tons and the price gradually increased along with the increased supply. That could not have been possible were it not for the organized effort of that organization and the co-operative marketing of that product.

One other important matter that I do not believe either of the speakers who have preceded me brought out and that is in regard to co-operative strength—the fact that an organization has the tendency and is striving not only to stabilize the market but to standardize the product. Instead of throwing stuff of all kinds onto the eastern consumer, all sorts of dirty looking peaches, all those products are being standardized.

Take dried peaches, for instance. We have had four grades. We eliminated two grades. They did not mean anything. "Extra choice peaches" was only a fill-in. If they did not have that grade for par, extra choice, they simply filled in with choice jumbo. There were three or four carloads of jumbo peaches to fill and that is all we had. There were twenty-five to thirty carloads sold. We eliminated the jumbos. We could not pack standard, choice, fancy, and extra fancy grades in every one of our eighteen packing houses located in different parts of the state. They are graded the same size of screen. It doesn't make any difference how the grades are packed, those four grades were identical. We have standardized the quality and the size of those four grades for the jobber. For a box of California peaches there is a standard and we know exactly what is in each box, because it is not one thing this year and another thing next year; the grade is the same year after year.

Standardization is the thing that the California producers in every line must look to from now on because that is the thing that is going to help popularize the products of this great Golden State.

Stabilization is another thing that the co-operative organizations are accomplishing. In the old days, before the days of co-operation, it was not an uncommon thing for a jobber, John Smith, we will say, to buy a carload of peaches or raisins, or pears, or what not, at five cents per pound, packed in fifty-pound boxes, and next week Peter Jones, who lives next door, or another big jobber, finds a carload identically the same grade, packed in the same way, just as good in every respect, for four cents a pound. The next week another jobber buys for a little less than that. What does that mean? There is no chance to stabilize the market when such conditions as those exist, because it is just one gamble after another whether Smith will buy the first car at five cents—he is going to get out from under as quickly as possible and he will buy for as little as he can and sell as quickly as possible. He does not feel very secure. He reasons that another jobber may be able to buy the same thing later for less money and there is no schedule and therefore he instructs his salesmen not to buy in that particular locality. If the customers insist on buying that particular product, all right, but don't push it. Right there is where he needs protection. We want to

eliminate that and stabilize the market and prevent such gambling. It is altogether a different story now, with the co-operative organizations. The jobber is protected now. The jobber buys today but the price is not named until we have a fair idea what the crop is going to be. Then the price is named with a legitimate profit and that price that is first named is guaranteed for a certain time and the jobber can not lose a penny if he wanted to. It is out of the question.

It means two results that are accomplished. It means that we have so many cars of peaches for this year, we will say. We naturally push them, the salesmen push them, and the retail grocer who buys at a price he can afford to pay pushes them and at a fair profit from the consumer. Why? Because the association in the first place has not put the price so high that profit is prohibitive. The price is given so as to provide a legitimate profit; and you all agree with me anybody is entitled to a legitimate profit, and that enables us to go on down the line and put your product into consumption. Isn't that the thing you want done? Isn't that the thing that will increase your courage in going on with your business and putting it up to two hundred thousand tons? It certainly is the thing which will enable you to handle, in a straightforward, business way, the products of the farmers of California, and without these co-operative selling and marketing organizations, ladies and gentlemen, your products will never be handled that way, and you know it because you have been through it.

What more can a grower expect than to receive a legitimate profit for his labor? There is just as much danger in the success of the co-operative marketing organization if it is overdone. That is to say, there is just as much danger to the grower if the price is put too high as there is if the price is put too low. The price of the commodity must not be put so high that it stops sales.

It does not take long for the eating public to forget a commodity. Especially is that true if it is not something they really must have, like flour, sugar, etc.; something that they may possibly get along without. They soon forget to eat it when the price is prohibitive; they turn to something cheaper and use that and they easily forget the other and it takes a long time to re-educate the consumers and bring them back to the old things they used to eat.

Consequently you can readily see where the danger is in putting the price of any form of production so high that it will be out of the reach of the consumer.

Of course, we might say right now that everything is so high it is out of the reach of the consumer. Probably these conditions will exist for some little time yet. They may exist for two or three years, perhaps. The world is not going to recover in a few weeks or a few months from the effects of the great war.

Right now I can tell you that France and Italy are actually in need of food, as well as other European countries; those two countries are particularly. America must supply a great part in helping towards rehabilitation of Europe, particularly in the food line.

The thing to do to reduce the high cost of living is more production. That is the only thing that is going to bring it down. It will never come down to where it was, I believe; it never will get back to where it was before the war. But I think we all agree that it will come down somewhat from where it is now.

Labor will not remain forever as high as it is now and production is the one thing that is particularly needed in America today.

You have here in your own midst one of your prominent men who is a natural born co-operator and a trustee of the California Peach Growers' Association, your friend, Mr. W. J. O'Connor of Chico. I believe that it is just natural in him, this thing of co-operation, because there is not anything that Mr. O'Connor can not see along those lines, and he just takes to co-operation like a kitten does to milk. (*Laughter.*)

I think if California had more men of that character, of that co-operative type, right here in your community, the thing would be settled. I am sure the California Peach Growers' organization is to be congratulated upon having Mr. O'Connor as one of those trustees, and as one of your trustees, those of you who are members; and your organization is to be congratulated upon it.

There is only one other thing that I want to call your attention to and to emphasize, and that is the point that the growers, or any organization can be

started in your town. Do not keep on flirting in and out. Do not zig-zag around, one year in the organization and another year out. Join the organization and stay with it. If a thing is worth doing at all, it is worth doing well.

Speaking of zig-zagging, it reminds me of a story they tell of a negro regiment over in France. There was one great, big, husky colored boy in the regiment who was a little bit nervous. He had gone through the training camp and he had gone into a front line trench, and they were expecting to receive an order any minute to go over the top. This colored boy was a little nervous about it. He did not know just what "going over the top" meant. He was not particularly anxious to be in that event, any way. (*Laughter.*)

As time went on he got more and more nervous and finally the captain came down the line. He said, "Captain, I would just like to ask you one question."

"What is it?" said the officer.

"This 'ere business of going over the top. I don't know just what that am; I would like to know something about that."

"Why," he says, "that's nothing, Sam. When the order is given you to go over the top you get right out of the trench, right over into the fire of the enemy."

"What's that? For the good Lawd's sake! Walk right into them big guns?" exclaimed the boy. "Why, that all the time turn round like that! Walk right in and get shot up?"

"Oh," replied the captain, "there's no question of getting shot up."

"What are you going to do not to get shot?" the boy said.

"Now, Sam," said the officer, "when they commence to shoot, you just take and zig-zag right through the bullets and then you will be all right."

"Yes, yes, I just keep on a zig-zagging," said the boy.

The next day the captain was going through the hospital and he recognized a lot of that colored regiment in their cots, and he noticed this particular boy down at the end of the ward. He was a nice, strong looking fellow, but he was bandaged to such an extent that his mother wouldn't know him.

The captain walked up to him and said, "Why, are you the fellow that asked me yesterday what was meant by 'going over the top?'"

"Yes, yes, Captain, I'se the fellow," he replied.

"Well," he says, "what in the world is the matter with you? What have you done?"

"Well, Captain, it's just like this," he said, "I done think about that ever since I'm here and I concluded that what I done was to zig when I should have zagged and to zag when I should have zigged."

Now, you growers are going to find yourselves in the same fix if you do not, year after year, keep to the same purpose. You should stay zigging all the time and follow the straight and narrow path; do not zag—for a single moment.

Now, I could stand here and talk to you about co-operation until sundown, but I know you have heard enough from me, and I certainly have heard enough from myself. I want to hear the next speaker, therefore I thank you kindly for your attention. (*Applause.*)

The Chairman—We have had a wonderful address, even though it is merely the sandwich that we have been enjoying.

I now have the pleasure of presenting Mr. G. Harold Powell of the California Fruit Growers' Exchange.

Mr. G. Harold Powell—MR. CHAIRMAN, LADIES AND GENTLEMEN: I had dictated two or three pages of the accomplishments of the citrus industry and some of the future possibilities of co-operation, but I have heard so many interesting things this afternoon that I will digress for a few minutes to make some extemporaneous remarks upon reasons for conducting producers' organizations.

This is the open season for ducks, fish and other things. Just at this particular time we are passing through the open season for the formation of co-operative organizations. We get all mixed up sometimes between the producers and consumers.

I was over in the legislature one night a couple of years ago and Colonel Weinstock was walking back and forth, smiling to himself

because he was just about to enter one of those Marathon debates with Senator Brown. (*Laughter.*)

The evening had progressed for some time and there was an attack being made on the Colonel's organization. A lady appeared in the general assembly and asked to be heard. She was a very small lady, not much higher than the table, and she made a vitriolic attack on the Colonel and upon these co-operative organizations and she said, "The time has come when we have got to curb their power."

She said, "I want you to understand that I represent the consumers of this country and I represent a large number.

"Now," she said, "the milk producers that deliver milk in Berkeley started out to raise the price from so many cents to so many cents."

She said, "I appeared before the council and prevented it."

She said, "I know what I am talking about. I am the mother of six children and I am a consumer."

An Irishman sitting near said, "Get off the floor; you are a producer, not a consumer." (*Laughter.*)

I was very much interested in Mr. Swett's talk about the high cost of living. There are more explanations than he gave for the high cost of living in these days.

I was down through the South a few days ago and I had a little talk with a darky I used to know down there some years ago when I was in Georgia. I noticed he had a fine crop and I said to him, "Rastus, you are going to make more money than you used to long ago with such a crop as that."

He replied, "Captain, I don't know. I may get a high price," he said, "but I ain't sure about how much money that is going to bring me."

"Well," I said, "isn't this your crop?"

"Well," he said, "not exactly. You see I am in partnership with Colonel Davis. And Colonel Davis, he says, 'I am going to make you a lot of money for your crop if the ducks don't get it.' I said to him, 'De ducks, how will they get the crop?' He said, 'Well, you have got a big crop of cotton and you get a lot of money for the crop.' But then Colonel Davis, he gets out a little notebook and after looking through that little notebook he says: 'Rastus, I have bought you a horse this year,' and he deducts the horse. And then he says, 'You used so many tons of fertilizer on your cotton crop.' And so he deducts the fertilizer."

In fact, Rastus found there were so many "deducts" from his crop that he came to the conclusion that "de ducks" got all his crop down there in the South. (*Laughter and applause.*)

I was particularly interested in what some of the speakers said about co-operative organizations. I think it is true. I think we are passing through a period of increasing strength in the co-operative movement throughout this country. Those who are working along that line have been making a drive for co-operative organizations throughout the country.

I was in Washington and heard a great deal about the attacks on the co-operative movement in California. I heard a great deal of what these organizations are accomplishing in this state.

After listening to these discussions and having been before a number of investigating bodies who were concerned with the California co-operative organizations, I was more and more convinced of the fact

that what our co-operative organizations need today is to protect themselves against the attacks that are made upon them. Sometimes the attacks are made to secure unfair advantage. The public is getting too high prices, for the buyers of the organizations are fixing prices on products higher than the consumer is able to pay. Sometimes the co-operative organization is not in the position to defend itself before the public as effectively as it ought to be.

I think one of the first things to be done in every one of our co-operative industries is to make a very careful study on the part of the organization of the cost of production of the crop the organization is interested in; to follow a definite system, a systematic plan so that the officials will know every detail of the work; that each get at the cost of labor, the cost of materials, and any other cost that enters into the production. The organization should make that investigation over a large number of productions and a large number of firms, and duplicate that for a few years and keep it up and in that way they will be able to withstand the attacks that are made upon the co-operative organizations.

There are not many organizations in California which can tell how much of their product is produced in the United States and give the cost of labor and of material and the advance in cost as compared with five years ago. Some have done that. That, in my opinion, is the first fundamental thing that should be done.

I think a careful investigation should be made in all the organizations of the cost of distribution, and what are the different functions performed, etc.

Sometimes a dealer, for example, goes into retail distribution, or the producer goes into wholesale distribution, without knowing the cost of transportation.

We need an organization to study the particular business and to understand its own business. It is not always a very sound proposition to go into anything without full knowledge of it. We should go into this thing without prejudice, without misconception. No matter how violent an attack that is made upon the organization, I have always found that when you sit down at a table with a reasonable man and show him what these industries have done in the past and what they are going to do in the future and what they are doing at the present time in providing a reasonable return on the investment in the interest of the producer, he becomes a friend rather than an enemy.

Now I have had a great deal of experience in the last two years with different government and state officials who have been interested in the co-operative movement. There is not any unfriendly attitude on the part of the officials in regard to the co-operative movement. They are subject to attack; there are complaints made, and a good deal of propaganda and these investigations have to be carried through. But, I do not think any organization need fear investigation if it can be shown that the prices which it is receiving for its products reflect fairly the law of supply and demand in that organization.

Whenever it can be done, use the powers of organization and ask from the public, prices which give a fair return and you will be directly in line with the law of supply and demand.

One more thing: If we do that, take care of all those factors, the less difficulty there will be in the development of the co-operative movement.

There is nothing that creates so friendly a feeling on the part of the public as legitimate publicity regarding the products. We don't want to have publicity merely for the purpose of setting forth the organization and what it accomplishes, but that it is one instrument for disposing of the products at a certain price. It is the encouragement of the friendly attitude on the part of the public which is going to help us with the consumer of the commodity. If we have a friendly feeling on the part of the public as well as on the part of public officials towards our organizations, we shall increase our organizations.

I think all reasonable people are doing what we know some people are doing, and what these various organizations are doing, through national publicity, and that we can have an enormous effect on the increasing consumption of products with the advertising, as far as the public is concerned. If the public is satisfied that will do more than any other thing to foster our organizations and to create the friendly feeling between the public and the industries.

I know of nothing which will produce better feeling between the organizations and the public than the pride which comes from living up to the advertised product. There is nothing which interests the Fruit Growers' Exchange more than the pride which comes from tracing the popularity of Sunkist fruit. That is a part of the organization publicity. There is no difficulty in enforcing standard regulations for Sunkist fruit on the part of the members of the California Fruit Exchange. There might have been five years ago, but there is not at the present time because the attitude of the public has been reflected in the minds of our own members. Our own members are proud of the Sunkist fruit because their packages represent the high quality of the fruit packed under that name and handled as a part of their own business.

So, I think we have a number of things in California that we might do well to remember and practice ourselves. And after we do, our position will be stronger in regard to the criticisms that may be made by the public regarding these organizations and regarding investigations, and regarding the distribution of a legitimate type of publicity. If the public understands that our organization is fair and honorable, indiscriminatory, our organizations will be benefited.

Now I want to speak to you about the accomplishments of the California Fruit Growers' Exchange and show you some of the possibilities of such an organization. I don't expect to go into detail in regard to the California Fruit Growers' Exchange, but to speak to you generally about what has been accomplished during the last twenty-five years.

It was organized in 1895 and it has gone through all the phases of growth that an organization of this kind ever went through. It went through years of contest on the part of the officers of the transportation companies. But these have gone by, and we forget them now and we realize, those who stop to think about it, that this form of co-operation is a good thing.

Our problem is to increase the efficiency and adequacy of the organization of the association, of the district exchanges, and of the selling agencies throughout the United States and Canada. We have the most highly developed, thorough organization from the producers' point of view and our problem is to see that the public will respond to our efforts.

The organization has grown very rapidly, until at the present time it has a membership of nearly 11,000—between 10,000 and 11,000. There are now two hundred associations—194, to be exact—members of the Fruit Growers' Exchange in California, having marketing operations. These are represented by district exchanges which, in turn, are represented in their dealings by the California Fruit Growers' Exchange. It has handled the products of the growers throughout the United States and Canada and other countries.

We are not concerned about the internal questions. Our large problem at the present time is to perfect the organization and make the consumers of this country appreciate the existence of the association. Therefore, we should start in on an advertising campaign and see that all orange and lemon growers and the public will respond to it. We will start a campaign of that nature.

Now I am going to confine myself in what I have written here largely to what has been accomplished by the co-operative movement and as to what some of the future possibilities are.

(*Mr. Powell then read the following paper*):

PAST ACCOMPLISHMENTS AND FUTURE POSSIBILITIES OF CO-OPERATION.

By G. Harold Powell,[1] Los Angeles, California.

Stated briefly from the industry standpoint, co-operation among producers has made it possible to develop the citrus industry, which represents an investment of $225,000,000. The groves, which comprise more than 200,000 acres, are owned by 15,000 families; there are employed nearly 30,000 people in the groves and packing houses; and the industry supports, directly and indirectly, more than 150,000 people.

In 1919, the citrus crop brought back to California $75,000,000. Approximately three-fourths of it, which was marketed through the California Fruit Growers' Exchange, cost the producer to deliver it to the jobbing trade, exclusive of freight, 1.62 per cent on its delivered value, including an expenditure of nearly one-half a million dollars for national advertising to increase the consumption of the fruit. Co-operation has made this the lowest distributing and marketing cost of a perishable food product in the world. The cost of marketing in 1919 was less than in prewar times.

Through the co-operation of the growers, the Exchange members in the face of a diminishing lumber supply are enabled to own their own timber lands, from which their box shooks are manufactured at cost, to purchase other packing house supplies, orchard supplies and other materials at reasonable prices, thereby reducing the cost of production; also to handle fumigation, fruit harvesting and other producing operations at cost. In 1919, the Exchange growers purchased more than $7,000,000 worth of supplies, representing a saving of hundreds of thousands of dollars, at an overhead cost of handling the business of less than 1 per cent on the value of the commodities purchased. Without the co-operation of the producer in providing his own system of delivering the fruit to the wholesale trade and in developing a large consumer demand through advertising and other intensive sales ways to take care of the rapidly increasing crop, the present production of 50,000 to 60,000 carloads could not be profitably marketed, nor could the future increase in the orange and lemon crops be successfully marketed. Twenty-five years ago, when the orange crop equalled 5000 carloads, the old system of purchase by speculators at the point of production collapsed. Today, through a national distributing system, backed by consumer advertising and co-operation with the dealer, the Exchange services are increasing the consumption as rapidly as the crop of citrus fruits develops.

[1] General Manager, California Fruit Growers' Exchange.

From the trade standpoint, the co-operation of the producer has made it possible to furnish the jobber and retailer a regular supply of standard grades of oranges and lemons the year around. The dealer's business is thereby taken out of the speculative class and put on a regular merchandising basis. Under the speculative system, the wholesaler or retailer must add a large margin to cover the speculative risk, the losses from decay and off condition. The wholesaler of fruits and vegetables usually must add from 10 to 20 per cent to the selling price and the retailer from 30 to 50 per cent, or more. As a result of the regular supplies furnished by the Exchange, the jobber's margins on oranges, for example, now average less than 10 per cent mark-up on the selling price, while the retailer's mark-up is not over 25 per cent, which is not far above the margin on non-perishable commodities.

From the public standpoint, the consumer has benefited from producer co-operation by the equitable distribution of citrus fruit, because it has made it possible for the merchant to deliver the fruit to the consumer at a lower overhead cost than is applied to any other perishable fruit or vegetable.

Co-operation, therefore, has reduced the cost of production to the producer; it has stabilized the producer's business; it has stabilized the business of the merchants who handle the product; and has given the consumer a uniform supply of standardized grades of fruit at the lowest possible distributing cost.

The future of co-operation will depend not alone on how well it handles the business in hand, whether it be in production, in distribution and marketing or in the development of a larger consumer demand, but also on how effectively it meets the vital questions of the day, which are leading to world-wide social and economic unrest. I will illustrate these problems by two examples.

The co-operative association should take up the question of the relation between the employer and the employee in a broad spirit of justice and humanity, with a view to effecting such changes in the industry and in the condition of employment that will lead to an increase in the productivity and the contentment of the individual who works. The industry and the workers are mutually interdependent, and their inter-relationships can be worked out only by mutual co-operation rather than by individual effort. Only through increased production by each individual can the present world shortage in commodities, with their resulting high prices, be overcome, and this can be accomplished only when the individual, whether producer or laborer, is a vital part of the industry and shares fairly in the progress to which his efforts contribute.

The co-operative movement must be an important factor in reducing the cost of living, if it is to play a vital part in future social and economic life. Through the co-operative purchase of supplies and in production activities, such as in the use of tractors, in pruning, fumigation, harvesting, packing and marketing, the grower may be more reasonably assured of the cost of production and a fair return on his labor and capital. But no group of producers has the right to operate collectively that uses the power which the public has conferred upon it through the legal right to organize to restrict production, to lessen the supply, to permit waste, to control the market, to speculate, to realize abnormal prices or exact excessive profits, or to create any condition through the power of its organization that is discriminatory or unfair to the public, or to a competitor, or which gives an organization, an officer or a member an advantage that is not open to all of its members alike. There may be as much danger to the co-operative movement from the abuse of the power of organization as there is from the attacks of those who oppose the co-operative principle.

A large share of the cost of food is represented by the cost of selling or marketing. This problem gives added importance due to the trend of population from the country toward the cities; and new impetus to the co-operative associations that perform a real social and economic service. Co-operation, properly applied, will simplify the distributing process and reduce costs. Unless an organization of producers confers a benefit on the public at large its future status as a part of our social and industrial life is problematical. The progress of co-operation will be in proportion to its ability to meet just such problems.

The Chairman—We have a little time for discussion—as much time as you care to take. The meeting is yours.

Mr. A. R. Sprague (Sacramento)—In the absence of other remarks I wish to offer a resolution covering a portion of your own address,

Mr. Chairman, and that of the president this morning. I suppose it will be in order, sir?

The Chairman—It is in order.

Mr. Sprague—I wish to offer the following resolution:

That a committee of three be appointed by the Director of Agriculture to proceed at once to organize a legislative committee representative of the agricultural interests of California, and whose expenses shall be provided by the several organizations which such committee shall represent, whose duties it shall be to determine what legislation shall be asked for by the producers of the state, and to diligently prosecute an effort to get such legislation enacted.

And, further, in emergency cases, such committee shall act in all practical ways for the advancement of the agricultural interests of the state.

I move the adoption of the resolution.

The Chairman—You have heard the resolution and the motion for its adoption. Is there a second to the motion?

Mr. F. B. McKevitt (Sacramento)—I second the motion.

Mr. Sprague—Just a word in explanation of the scope of the work of this committee which was in my mind in offering the resolution.

There are many things which all the agricultural interests in the state have in common; in which there is no technical difference of opinion; in which the desirable thing is agreed upon by all. Of course, such things will be fundamentally the work of this committee to attend to. I can see also that it will have an effect over all of the associations representing the agricultural interests of the state.

I trust the committee will be so organized that it will be truly representative, not only of the co-operative interests but also of the other agricultural interests; and that in cases of emergency it will operate to save interests which otherwise would be lost.

(*Chairman Mills then put the motion to the meeting and it was carried unanimously.*)

The Chairman—We will now have a packing demonstration.

(*Whereupon Dr. W. L. Howard and Prof. W. P. Tufts of the Division of Pomology, College of Agriculture, Davis, gave a demonstration of packing methods, with a talk accompanying the demonstration.*)

(*A recess was taken until seven o'clock p.m. of the same day.*)

Jujube trees in full bearing at the Chico Plant Introduction Gardens of the U. S. Department of Agriculture. This stock was sent from China by the intrepid plant explorer, the late Frank N. Meyer. (U. S. Dept. Agr.)

Many people have mistaken ideas about grades in oranges, thinking the size has to do with the grade, and we often meet with people who have the impression that a large orange is a fancy orange, because of its size.

I believe this is true in the grading of olives, and the larger they grow the more valuable they are. This is not so with oranges; in fact it is often a detriment, for if too many large sizes are shipped in a carload lot, they are subject to a discount in price.

Some years when through climatic conditions, oranges run in excess to large sizes, the whole seasonal average is affected; for the simple reason that the man who buys to sell to the consumer is unable to get as much money out of a box of large sizes as he can get out of a box of medium-sized fruit. It means a difference of six to eight dozen oranges in a box, between large and medium sizes, hence it is plainly to be seen that the trade does not want an excess of large-sized fruit.

A standard carload of oranges consists of an assortment of sizes, not too many large and not too many small; but a fair distribution of large to small.

The grade is not established on size, as a small fine-skinned orange is just as fancy as the largest, and command the same price when loaded in standard-sized cars.

In dealing with the fruit trade, it is precisely the same as in other lines of business: When a clothing merchant orders a shipment of men's suits, he doesn't want all "Fatty Arbuckle" suits, nor does he want all "Charlie Chaplin" suits, but he wants an assortment, so that he can sell to anybody who wishes to buy.

And so it is all along the line, whether at a hat store, shoe store, furniture store, or any other kind of business, an excess of any one size would be unsalable.

Hence you will understand what we mean when we tell you that large oranges are not more desirable than small oranges. Of course there is a certain limited trade which will take larger sizes, but this trade is not big enough to take any noticeable percentage of your shipments. The man who buys to sell to the retail trade will pay more for a box of medium sized oranges than he will for a box of large oranges, and those are the men who buy the great bulk of your fruit.

The commercial pack of oranges is constantly being improved upon, more care being used in handling and wrapping; packers using gloves to guard against finger nail damage; the packing boxes made with beveled centers to prevent cutting and bruising; and all packed boxes are now strapped with pliable strapping to avoid the loose pack appearance on arrival at destination. All cars containing oranges for Eastern shipment are provided with floor racks, and every car is paper lined to avoid danger from freezing en route. In olden times many carloads of oranges were practically ruined by frost in passing through Middle West blizzards, but under improved methods this danger is very remote.

Now as to standardization: During the past few years great strides have been made in the matter of quality and pack. Our State Commission, headed by Mr. George H. Hecke, is to be congratulated on results obtained by standardization. It is true that some of us have thought at times there was a little too much technicality in their rulings, and some practical fruit men may still think so; but we sincerely believe from a standpoint of general results the whole thing has been a wonderful success, and is making for better quality, grades and packs.

No doubt everybody in this room is familiar with the many controversies over what is known as the 8 to 1 chemical standard for oranges; we do not believe in this method of determining the fitness of an orange for market; we believe the natural color should govern the standard of maturity, and when an orange is substantially colored on the tree it is ready for shipment. It is self-evident that natural tree-colored fruit is far more desirable and palatable than fruit picked when green outside, and then artificially colored by heat, even if it does conform to the chemical test. However the latest rulings, as adopted by our last Legislature, modify the old ruling somewhat, in which it defines the percentage of color for both tree-ripened and sweated fruit. Oranges reaching the chemical analysis of eight parts of solids to one of acid, must show at least 25 per cent natural color before they can be sweated to color, while oranges not reaching the 8 to 1 test may be picked when showing 70 per cent color on the tree.

This, in our judgment, is something of a victory for the natural-colored fruit, and in a mild way condemns artificial heat for color.

And this is as it should be; the Butte County oranges of natural color will always give satisfaction. Never in our recollection has there been complaint on oranges from this district which have been shipped without sweating. Good *live* well-colored fruit, without artificial heat, and regardless of any chemical test, will

always be in favor, and it is on these lines that Butte County has built up a splendid trade.

Oranges heated to color carry a dead and pale appearance, while oranges allowed to color naturally have that deep orange color which pleases the consumer.

The State Department of Agriculture is doing a great work in this state, and it well behooves all of us to render it our hearty support. Through the different departments it can, and will assist you in showing the way to eradicate pests and diseases of plant life; it will use its best offices to demonstrate the most efficient method of pruning, cultivating, and general care of your orchards; and if you will take advantage of their co-operation in these things, I am sure you can grow better fruit, and more of it.

Our State Department has done great things in the matter of standardization of deciduous fruits, which has been no small task, considering the many varieties and different methods required.

The picking and packing of fresh fruits, berries, and vegetables has shown vast improvement during the past few years, and the strict regulations have brought about more careful cultivation, spraying, and thinning of the different varieties. These are the things which make for success, and we know from our own experience that California enjoys a far better reputation for her products in the eastern markets than she did before standardization was in effect.

There are less rejections, less complaint, and a greater demand at satisfactory prices. The dealer now can feel reasonably safe in ordering his supplies direct from California, knowing that fruit bought from reliable shippers will be properly packed and loaded.

In all these matters the producer, the shipper, and the state authorities should co-operate, and each and every one of us work together for the common good.

Speaking of co-operation, the interests I represent believe in co-operation; co-operation with the grower, and co-operation with the consumer; we strive to assist the producer in every possible way, to help him produce good fruit, to give him the benefit of our judgment in packing and marketing, based on many years' experience; to place his product in the best markets for that particular product; and to keep faith with the consumer by giving him legitimate pack and quality for his money.

The best form of co-operation is that which holds people together through mutual satisfaction and confidence, one in the other, and which keeps clear of entangling liabilities.

We believe in real co-operation in its true sense, and we believe in good team work between the grower, and the shipper, and the consumer.

The Chairman—Mr. Mason represents an independent concern and one reason why the association is so effective and so worth while is because of the fair-minded attitude of Mr. Mason and the fair handling that he has made of the fruit of this territory.

I am going to make a slight change in the program this afternoon as we are especially fortunate in having with us the genius of the California Fruit Growers' Exchange; the State Treasurer of the Fruit Association, an association of men who are developing the co-operative idea. It is the biggest thing of its kind in the state and it is largely due to the efforts of the California Fruit Growers' Exchange and because of the genius of this man who has been and is now the General Manager of the California Fruit Growers' Exchange that it has accomplished what it has. They have developed these exchanges nationally and they are very effective. I want to call upon Mr. G. H. Powell to tell us something about co-operative advertising and something about his wonderful organization. (*Applause.*)

Address of Mr. G. Harold Powell.

MR. CHAIRMAN, LADIES AND GENTLEMEN: If you want proof, absolute proof that olives don't kill, you have it right in front of you. (*Laughter.*) I was out with my friend, Mr. Horning, and he loaded

up the car with several gallons of olives and has been most of the time demonstrating to the people that there are no killing effects in olives.

I was very much pleased to have the opportunity to look over your country this morning, to go through your olive groves and to hear of the plans you have for the future, for the development of the large watered territory whereby you are going to bring into bearing a very large number of acres and different types of trees and fruits. Wonderful enthusiasm came from my friend, Mr. Horning, while taking us around the country this morning. I was enthused while he spoke about the wonderful country that you have here.

It reminds me of a story of a man in Los Angeles who was developing a suburban tract. He advertised it very extensively in the newspapers and spoke about the wonderful country he had. He described it as being in the heart of Los Angeles. He spoke about the mountains on the one side and the orange and lemon groves on the other. But when you came to go out to that tract you found that the heart of Los Angeles happened to be about thirty miles distant from the geographical center of the city. He was very much discouraged over the proposition in reality, but he put his ads in the paper and announced the opening day, and when the people didn't come on that first opening day he postponed it until the following Monday morning and still kept his ads in the paper.

On the Monday morning he went out and sat there in his office waiting for the buyers to come out. The trolley cars came by and they brought nobody for several hours, but at last one man got out of the suburban station and came on to the tract.

Our real estate friend saw the man coming, and with ready wit picked up the telephone and put it to his ear and said, as though he were talking to somebody:

"That corner you want is five thousand dollars. No, it can not be sold for less than that. Mr. Dickey has bought one on the right of it; Mr. Messenger has taken the one on the left. The other lots all around there are going very quickly. There is no discount. You don't have to take it but if you want it you can do so right now, but we can not take a cent off the purchase price. No, you must pay twenty-five hundred dollars cash and I must know in three hours whether you want it or not. All right, I will hold the lot for you."

Then he turned around to the poor fellow who was walking up and down the room and said, "Good morning, what can I do for you?" "Why," said the man, "I am the telephone man. I came to connect your telephone." (*Laughter.*)

I was very much interested in driving around the country this morning and looking over its wonderful opportunities and the fine orchards you have here, and was asked to say something to you about some of the fundamental conditions under which our California crops are put on the market, so I will talk to you for a little while about the exchange. I am not going to talk about eight-to-one, because I don't believe in introducing anything that would break up a nice party. I will let my good friend Mason have the floor on the eight-to-one proposition. (*Laughter.*) But I want to say something to you about the real problem before the citrus industry in California, because there are a number of problems that are very pressing and I think the fruit growers of the state should know something about them and we should draw some lessons from these things we are told connected with the industry.

This citrus industry, as I told the meeting at Chico, has grown very rapidly.

There is something more than two hundred thousand acres of citrus fruit land in the State of California, representing an investment of about two hundred fifty million dollars. There are about fifteen thousand families on the land. The tracts are mostly small, so that there are something like twenty-seven to thirty thousand laborers in the groves and packing houses or connected with the industry and one hundred fifty thousand people or more dependent on the industry, being the families of the different ones who gain their livelihood in it.

This citrus fruit industry therefore is a great industry and brings an enormous return to the State of California. This represents about seventy-five million dollars in profits, and fifty-five million dollars this last year went through the exchange by marketing of the fruit of the state.

Co-operative growers are those who co-operate among themselves in the handling of their own shipments of fruit in their own interests. There are in the exchange about ten thousand five hundred growers and they have about two hundred different associations in about twenty different district exchanges who are represented by their marketing agents in the transacting of business on behalf of the exchange.

All of these different activities are exerting their energies for the producer.

Now I want to bring out very briefly a few of the problems confronting the fruit industry in relation to the co-operative movement in the State of California.

We have in normal years about sixty thousand cars of citrus fruit going from California, representing about thirty-five thousand cars of navel oranges and twenty-five thousand cars of Valencias. Sometimes it runs up above that figure. Then there are several thousand cars of miscellaneous varieties and ten thousand or more cars of lemons.

Now the problem of all this industry is the increase of production and the marketing of the production to take care of the normal trade and the increase.

It is not a distinct problem for the Washington navel orange alone. For a long time there was a great increase in the citrus industry due to the Washington navel, but in recent years there has not been a rapid extension of that part of the industry. The Washington navel industry in the older districts is not as active as it was formerly. There was some difficulty in the older districts and the problems confronting the development of the industry elsewhere brought the yield in the older districts down very low. I do not imagine there will be a very large increase in the total output of the Washington navels in the next ten years in California. The competition in navel oranges in the past has been between Florida oranges, the Florida grapefruit and the navel oranges. The competition will be with other fruits like apples and the deciduous fruits. The competition in the future with Washington navels will be increased production of southern fruits from Florida and the largest increase will be in the winter time in the next ten years of oranges coming from the southern countries and not from California. We shall see Florida developing very rapidly in the next few years, especially in grapefruit and oranges and there will be competition in

navel oranges which will affect this whole district by the extension of the Valencia crop into the navel season.

There were fifteen thousand cars of Valencias shipped from California last year and that will be largely increased this year.

Now as to the Valencia problem. We produced more Valencias in California this year than the total crop of Washington navels last year. The summer orange business is an entirely new business here and the Valencia orange crop has developed rapidly, and also the grapefruit crop. We are in competition in that respect with the State of California and we have only just begun on Valencias.

I should like to see an increase of from thirty to forty per cent in Valencias in the next five or six years. There is a vast acreage of Valencias three or four or five years old in Orange County, Los Angeles County and different parts of other counties in the southern part of the state. These acres are situated in the very finest district, so far as production is concerned, and we may expect within a very few years there will be more than thirty thousand cars of Valencia oranges shipped out of the state. Now there is the problem. We are here to develop the summer orange industry.

When we had four or five thousand cars of Valencia oranges some people doubted whether they could increase the consumption enough to take care of that enormous crop. Now we market twenty-five thousand cars and still the crop is increasing, and so far as the future is concerned I do not see any reason why Valencias can not be sold in increasing quantities for years to come so long as the people of this country have the money to spend on them. If the conditions of the country change and become such that they do not spend freely it will affect the oranges, but under present conditions there is room for considerable increase and there is no reason why the Valencia orange market can not be increased and if it is given publicity enough it is bound to increase.

It is apparent that the market is stable because the merchant is building up the summer fruit business. Nothing else is so stable as the summer orange. Because of its lack of perishability it is standard and stable and all it needs is publicity to keep the industry at top notch.

We shipped from California this last year as many lemons as had been consumed in this country for many years. California placed an import duty on lemons. We increased the consumption from fifty to sixty per cent and in the next six or seven years to come there will be a rapid increase in consumption of lemons. Therefore you have got a stable consumption which can be relied on for the next fifteen years. It is not a fluctuating market so that our problem is how best we may increase the production and consumption of lemons. We have not been able definitely to form any plans in the past because of the large increase in imports. Before the signing of the armistice for several months California supplied practically all the lemons in the country. The lemons did not come in from Italy. The consumption per capita of lemons in three months varied, but for the period of three months it increased eighty per cent. But the interesting part is that as California took the market and furnished a stable and uniform supply at reasonable prices and at uniform prices, this remarkable thing happened: the consumption went up, and the merchants, the large jobbers and retailers realized that the charges for the product immediately came down because the supply,

instead of being a speculative supply, which has been the trouble with foreign imports, was a steady supply and the merchants bought each week what they needed and came back for a new supply.

When you put a product on the basis of a uniform supply and the product is turned over quickly it is good, for the trade today is one of the greatest methods of increasing consumption.

Now those are the problems. How can we increase the per capita consumption of oranges and lemons in this country to take care of the rapidly increasing stock?

That does not frighten me at all. When we had five thousand cars of navel oranges in this state and depended upon the ordinary system of selling to independent buyers or consigning the fruit to wholesale houses, the whole thing collapsed. The growers had their fruit held on their hands or wrestled with the problem of delivery of their product and took their chances on supplying the trade of the country, and the industry did not prosper.

This has been changed, due to the fact that so many of our growers are co-operating and pulling together in both the citrus and deciduous fruit industry and they have been able to do this which under other conditions they were entirely unable to do.

One thing the co-operation system has had to do, in addition to putting the industry on a better distributive basis whereby those desirable of distribution have been largely eliminated is, we have been able to go right out to the American consumer and convince the consumer that oranges and lemons are desirable table fruits; furthermore, that they have many additional qualities.

For instance, we hear people say nowadays: "If you feel sick take a lemon. If you don't want to be sick do the same thing."

That is one of the things co-operation has been able to accomplish through co-operative advertising, and this advertising has its commercial value.

Now, take the problem of salesmanship. It eliminates the problem of the jobber and the retailer. The co-operative business is the only source of responsibility to the consumer about that particular product. The commodity is put on a firm basis of merchandising. No commodity, no merchandise can be put on a national basis, nor can the per capita consumption or use of the commodity be greatly enlarged, because no jobber, no jobber organizations, no retailer, no retail organizations are organized in such a way that they can make an appeal to the person who finally uses the commodity unless by co-operative means. The only person interested in the product is, first, the producer; and, second, the consumer. Those two are all that are essential and that should work together; that is the problem of production, distribution and consumption. The problem of distribution of an industry in its final analysis depends upon perfect business organization in the handling of the product.

The next problem of these different industries in California is to place the products before the American consumer in such a way that the consumer will use more of that product. It is not a jobbers' problem; it is not a retailers' problem. It is the problem of meeting the demands of the consumer. And our problem is how to go to every man, woman

and child in this country and make them feel that oranges, lemons and grapefruit are good for them and that they ought to have more of them. We must convince them that the product is healthful and desirable in every way, and if you do that you will create very quick demand on the part of the American consumer for oranges, lemons and grapefruit which, once created, you can not stop.

I was very much interested in that fact in the fall of 1917, and of the value of advertising and creating the demand. We had an enormous crop of potatoes throughout the United States. The year before potatoes had been very scarce. The American farmer did as he always does when there is a scarcity. He puts everything out into potatoes, if that is the scarce commodity, the following year. It was true of watermelons. The farmers put out millions of acres of watermelons because the scarcity of watermelons the previous year had resulted in high prices. In 1917 we had this enormous potato crop, but there was a shortage of cars. The producer received very high prices. He started out in 1917 wanting two dollars a bushel for his potatoes. They did not move. The result was that in the early fall he didn't move his crop. The producer had to wake up to the fact that he must take a lower price. Then strikes began and labor disturbances which stirred up Eastern transportation. The spring came on and an appeal was made to the Food Administrator. We had to sell those potatoes. We put on a publicity campaign and the American people were told they should eat potatoes. We said it is our patriotic duty to eat potatoes. We said that it was a patriotic duty on the part of the consumer to do his part as the producer had done his. And the people woke up to the patriotic duty and got to eating potatoes, and you couldn't stop them. They had them for breakfast, lunch and dinner and they had them between meals, and the result was that most of the potato crop was moved without difficulty at all because the Food Administrator had awakened interest on the part of the man who buys and the woman who buys.

But there is always a sequel to a thing of that kind. When the crop was consumed the consumer still demanded potatoes. And when the price went up we had to go to the consumer to stop him eating potatoes.

There is where you have a definite example of the benefits of publicity. National publicity appeals to the American people and they respond to it. That is an example of successful advertising.

It is our problem to take care of the products that are grown. It is easy to take care of a good product if it is rightly handled. In the California Fruit Growers' Exchange we make an assessment against every member who ships oranges, lemons, grapefruit, or what-not. This assessment is very small but it covers the expense of handling the product and of this campaign for national advertising, and for the price of three or four cents a box overhead expenses spent in that way the product is handled between the producer and consumer.

We make an appropriation for advertising. We may spend $500,000 or $700,000 on advertising, depending on the size of the crop. But it must be distinctly understood that you can not advertise any product successfully unless you have something to advertise. That is fundamental.

Nothing is more detrimental to the interests of the California fruit industry than to advertise oranges that are green and lacking in sugar

quality or in selling oranges that are frozen, because you simply fool the consumer and the consumer afterwards will not buy oranges which he has reason to suspect he may be fooled on the second time. No matter what the quality of the oranges is the first year, unless the consumer wants the oranges the second year you can not sell them if you have fooled the consumer the first year.

The first consideration in extending the consumption of your fruit product is quality. The second consideration is grade, or uniformity of the product that is advertised. Unless you have uniformity in the product advertised it is money thrown away.

I can not conceive of anything that can do more to increase the consumption of olives than to put olives before the American people which are uniform in grade. I know of no product that the skillful advertiser can handle and make popular with the California public so much as the ripe olive, provided you control the pack in such a way that the product is uniform in grade; that you can advertise through your publicity campaign as uniform in grade. Anyone who undertakes national advertising must put in a system of inspection through organized effort which controls the product and provides uniformity so that the industry will live up to the grade advertised.

Last year we had a number of inspectors going through the packing houses to see that the packing houses and the association managers kept up to the grade of Sunkist fruit. In your olive business you must provide for this inspection to see that the grade is maintained.

I don't think there is anything more important in the advertising campaign for California ripe olives than to take care of uniformity of grade and the uniformity of the product by means of adequate and periodical inspection. That has much to do with the question of increase in the demand on the part of the consumer and you have a situation where you are up against a stone wall unless you create the demand in advance and meet the demand.

That is what advertising has always to do, to create the demand in advance of the product so that the producer will be stimulated to produce to meet the demand. And the demand will take care of the product when it is produced. That does not always come in the first year or in the second year. But the product is an easy thing to handle if you are organized to handle it.

National advertising is two edged. Unless you can enforce grading of the product you present to the public and unless you create the demand on the part of the consumer and put in a system of grading which operates in the packing house you fool yourself and you fool the public; and you can not fool the public twice. You must create a fine feeling of friendliness on the part of the public which makes them respond to the appeal. And that can only be done by keeping quality and uniformity before the consumer.

There are one or two things about national advertising that I referred to yesterday which I should like to repeat today. National advertising creates a demand which the trade cashes in. The greatest benefit of all national advertising is the benefit to the industry itself; the pride which the industry takes in presenting the product to the public in such a way as to make the public feel good about it. For instance, the olive grower produces a grade of olives of such a standard that the olive grower is proud of his product. The packer puts up a uniform grade and the

product would be looked upon as the output of a standard industry which can not be maintained if the packer lets down on the grade. If the packer lets down on the grade he thereby injures the reputation of the grade which is advertised. Unless you act as your own policeman you have not gone as far as you should. There you get from the organization, the members of the organization, such pride that if the packing house let down on its grade not only other packing houses will look down upon it and point the finger but the grower himself looks down upon it.

You go across the continent on the Santa Fe Limited, or on the Sunset Limited, or on any of the through trains and you will hear the passengers ask for Sunkist fruit. Or they will remark amongst themselves, "There is where the Sunkist oranges come from," or that they will pick our fruit. The Sunkist fruit is sent from California in such a way that the growers take pleasure in pointing to it and that pride is a part of the advertising, it becomes a part of their loyalty towards the association which creates the demand and fosters it by uniformity of grade.

Co-operation is always successful in that spirit. You can not hold people together by contract; you can not hold them together by resolutions. You can hold them together through co-operative organization in any industry. But you must make an appeal in the co-operative spirit to the producer. Unless the grower comes to believe that the co-operative method of transacting his business is best for himself, for his family and for his community he will not have faith in the system. When you have built up this fraternity feeling in the organization between the members you have got co-operation founded on a rock which can not be split.

Of course, all co-operative organizations have trouble in holding their members. That is a part of the game in every fruit growing district. I enjoy that game thoroughly whenever I get into it. But no co-operation or no co-operative organization can live unless it is established on uniformity of product and unless you convince the members that it is wise for the industry and good for the community.

For your territory here, I believe that for olives particularly there is a wonderful future and that you have a wonderful opportunity of presenting the industry to the public and that there is no difficulty in creating a demand on the part of the public which will keep pace and run ahead of production provided the encouragement of the growers is given so as to produce confidence on the part of the producer. But, of course, the industry must be profitable. If you haven't any profit in the industry there is something wrong. An industry can not live unless it can get the cost of production plus a reasonable profit, and advertising is the way to produce that result provided the product has quality and uniformity of grade. And in that way you will encourage the grower and imprint that wish in him to get a larger return for his product put up in that way.

I am very glad to have had this opportunity of discussing these things which I think will aid in taking care of and increasing your production of some of our California crops. (*Applause.*)

The Chairman—We thank you very much, Mr. Powell, for your address, and I am sure everyone in this room feels that way about it.

We are fortunate in this city that we have an olive man for mayor.

Our mayor is an olive man of long standing. His name has been connected with the olive industry for a long time.

I have great pleasure in calling upon Mr. E. W. Ehmann of Oroville to address you. (*Applause.*)

MR. CHAIRMAN, LADIES AND GENTLEMEN: I am very glad indeed to have the privilege—because it is a privilege—of speaking to an assembly of fruit growers. We have heard from Mr. Powell some of the natural results of co-operation. I am very glad that I attended this convention to hear that subject alone because we are just in our infancy in confronting these problems and would be able to profit from a man who is high in years of experience and observes the result in the way that Mr. Powell has expressed. It is certainly a splendid thing for us.

My paper this afternoon is on the subject of "Packing Ripe Olives."

PACKING RIPE OLIVES.

By E. W. EHMANN, Oroville, California.

The subject of this paper brings to memory the time when twenty-two years ago we first started to pack the ripe olive and the trials and tribulations attendant upon not only learning the proper method of processing the fruit but the long weary struggle to introduce the ripe olive to a market most thoroughly occupied by the green olive.

At this time the ripe olive was a hit and miss proposition and mostly miss. What little fruit was being put on the market was pickled in tubs or barrels in the back yard or in the barn and sold to the local grocer. A little of this fruit found its way East but spoiled so promptly and thoroughly that the general verdict was "once is enough for me."

Our president, Mrs. Freda Ehmann, made four trips to the East to interview the trade, after which this part of the work fell to me and I used to make annual trips all over the United States. It was mighty uphill work breaking into the green olive demand and we used to adopt all sorts of expedients. At our meals on the dining cars or in the hotels we used to order California ripe olives, and either we got a blank stare from the waiter or he said he had them and brought in a dish of green olives. Time and again we would bring a bottle of ripe olives to the table, open them, and treat everybody within reach.

We found it necessary to begin right at the bottom and work with the individual, for the grocer generally declined to stock the olives stating that he could only purchase when he had a demand. A great help in this early pioneer work to establish a demand was from the tourists who visited California, who became familiar with the delicious eating quality of the ripe olive at the different hotels and then took this taste back East; with the result that a few orders used to trickle back to the coast.

We used to have any number of packages of olives returned to us with a letter stating that they had opened up as black as your hat and consequently spoiled. The "black as your hat" was a favorite expression, and in some psychological way would pop into the minds of dealers thousands of miles apart when they had their first glimpse of a ripe olive. We also gave away thousands of gallons gratis just to get people to taste the ripe olive.

The only thing we could do was to get the people to taste a ripe olive. I remember a personal experience I had with the English trade. Englishmen are very set and fixed. An Englishman has to convince himself; you can not convince him.

I went up to British Columbia and had to interview a grocer. Some of the Englishmen would come in and I would ask one to taste a ripe olive. He would look at it and say, "I don't fawncy it," and then I could not get a ripe olive down his throat. He did not like the looks of it.

We had to begin with the consumer and in that connection I remember one selling experience I had.

A gentleman said to me one day, "Well, if you are so thoroughly convinced that the ripe olive business is good give me a keg of ripe olives and I will see what I can do. I will put it on my counter and see if the people will take to them."

We gave him ten gallon kegs of olives and he put them on his counter there in his store and his customers began to eat ripe olives. He wanted more. That man today is buying anywhere from seven to ten thousand kegs of olives every year.

After the first five years this pioneer work began to bring its results. Then the advent of other packers into the field with their assistance in helping to create a demand made progress much more rapid, and as early as 1905 grocers on the coast began to notice a decided falling off in the demand for green olives. Today even the grocer in the East is willing to admit that the finish of the green olive is in sight and the ripe olive will hold undisputed sway.

Now that was the pioneer work and today the problem is the proper packing of the ripe olive to not only hold the demand created but to enlarge the field of consumption. The European War, which cut off the supply of European olives and olive oil, turned an unexpected demand to California which has given us an opening into all of the markets of the world. Our packers were quick to take advantage and now a package of California ripe olives can be bought in every civilized country on the globe. Hence in the short space of twenty-two years our firm has seen the California ripe olive, from a very humble and unobtrusive local product, become an industry which is spreading its products all over the world and which in California bids fair to become the principal industry of the state, for I predict that some day the acreage of olives will be far ahead of any fruit grown in this state.

Now to put out the right kind of a pack it is necessary to start at the beginning, and that means with the tree. Experience has shown that the Mission olive is by far the best variety for pickling, since it is firmer and better flavored than the Manzanillo, which is its nearest competitor. The grower must study proper methods of cultivation, irrigation and pruning to deliver to the packer the best quality of fruit. Then it is up to the packer to do the rest.

Right here let me say that I can not too strongly condemn the practice of picking an absolutely uncolored green olive and then processing this fruit so that it goes out in a bottle or can under the label of a ripe olive. It is a mistake to think that the buyers of the large firms are not able to detect the difference between this unripe fruit and the tree-ripened pack. These men have been posting up from all sources until today there are very few men who are the heads of the buying departments of the grocery and catering firms of the United States who can not tell that class of fruit almost at a glance. It is also a mistake to think that this class of fruit will get by with the consumer. I have personally had numberless inquiries by letter or in person from people who are wondering why the California ripe olive was such a "woody, flavorless" product and the day is rapidly coming when the consumer will be just as able to pick out the pack of ripe olives that is a tree-ripened fruit. Both the grower and the packer unfortunately are closing their eyes to this side of this question and giving entirely too much weight to the danger of frost nipping a portion of the crop if the olives are left on the trees until fully colored. None of us must lose sight of the fact that the entire future of the ripe olive industry depends upon the quality of the pack. I have heard entirely too many people say "if the woody, tasteless, salty stuff that I have eaten is your much-vaunted California ripe olive, then excuse me from eating any more." A grocer friend of mine once said, "I can sell the first package of any food, but the contents of the package itself must sell the second." I would respectfully refer that quotation to our grower and packer friends who want to strip their trees this early in the picking season and then pack as California "ripe" olives. Therefore, on this question of quality of the pack, with its bearing on the mutual interest of both grower and packer, a word to the wise should be sufficient.

It would be a splendid step forward in a ripe olive industry if the growers and packers should mutually agree on a standard size for ripe olives. In considering that question we must face the problem of whether we should foster the system of buying on grade as against buying on orchard run.

It is too bad, it is a real shame, that olives should be the only fruit where the small fruit brings exactly the same price as the large. Gentlemen, you can not sell your small prunes for the same price as the large. You can not sell small peaches to the canneries for the same price as the large peach is sold to the

packing concern. Why should olives be sold orchard run or on a tree basis? Packers can not sell ripe olives that way. We must sell according to size.

As Mr. Powell said, there is one item where the growers and packers must get together. And the basis on which we should get together will be a fair adjustment as to price. The one thing on which success of the olive industry will be based, as every packer will tell you, on the final outcome is buying according to grade. I think Mr. Meek will agree with me on that.

Let us also not delude ourselves with the idea that California will always be the only country in the world which can successfully produce and market a ripe olive. Arabia and other oriental countries have been pickling ripe olives with exactly the California process for centuries, and travelers today will tell you that the Arabian camel driver carries a goat skin filled with ripe olives in brine similar to our California ripe olive, only much inferior. Suppose these people wake up to the market for a ripe olive and earnestly study to improve their pickling process.

We consider in California the olive has now arrived to the dignity of being termed an "industry," and we point with pride to the fact that we have nearly 50,000 acres planted to olives. Just look at these figures for a moment: Spain alone has over 4,000,000 acres in olives and every year is planting over 50,000 acres of new olive orchards. Australia also is successfully growing olives and is already supplying its demand with home-produced olive oil.

During last year we had men from Australia inquiring particularly into the pickling process adopted for the California ripe olive. They said their olives were almost similar to the California fruit.

We have had a number of inquiries from the Philippines, where olive trees seem to be growing in profusion.

If we will pack a tree-ripened olive only we can keep out foreign competition provided we have a tariff which will represent the difference in labor costs. Both grower and packer should use every effort to obtain the necessary protection for the ripe olive industry through a protective tariff. While the scale of laborer's wages has advanced in all European countries, at the same time a still heavier ratio of advance prevails in the United States, and if we were able to obtain the same tariff of four years ago, our protection would be even less today than at that time.

I strongly urge that both grower and packer lay aside every difference of opinion and action to unite in the election of a Congress and a President pledged to an increase in the tariff.

This matter will be taken up at a later date through the California Ripe Olive Association and we ask the support of every fruit grower to this vital question of n increase in the tariff.

The Chairman—We will now hear from Professor Bioletti.

Prof. F. T. Bioletti (Berkeley)—MR. CHAIRMAN AND GENTLEMEN: The fact that very little attention has been given, comparatively speaking, to the olive industry and the study of olive growing by the Agricultural College is the fault, I think, of the olive growers themselves. Where pressure is brought to bear upon the department there must be some investigation, and some investigation has been made of the problems of the olive industry through the College of Agriculture and through the appropriations for the deciduous fruit investigations. As far as I have been able to learn there has been no demand made from any olive association or anybody representing a large number of growers directly to the College or directly to Dr. Whitten, who is in charge of the appropriation.

I think the law specifically mentions olives as one of the fruits which should be investigated under the provisions of the appropriation. It does not make any difference how large the appropriation is, the possibilities of investigation are almost sure to be greater than any possibilities of appropriations. So, of course, the administration of the appropriation will be focused on the point where there appears to be the most demand.

So, I would suggest that the olive growers of this district and other districts get into correspondence with Dr. Whitten and let him know what your ideas are and what your needs are, and prompt investigation of those subjects will be made on account of the difficulties you have in the industry and the present size and importance and possibilities of development of the industry.

Now my subject, according to the program of this convention, is "Olive Culture with Special Reference to Pruning," and, as the chairman has intimated, there is not anybody at the University who knows much about olive growing, and that is the only reason they got me to talk on this subject. (*Laughter.*)

However, sometimes the views of an observer, of one who hasn't got any fixed opinions or ideas, are of value. You men of experience will pick out the fallacies in the suggestions I make and if there is anything obviously foolish the growers will, undoubtedly, see it and there may be, possibly, some suggestions of interest from an amateur who observes, which may be of value to you.

OLIVE CULTURE WITH SPECIAL REFERENCE TO PRUNING.

By F. T. Bioletti, Berkeley, California.

The quantity and quality of the crop of an olive tree, or of any other cultivated fruit tree, depend on two groups of factors: First, the natural conditions of soil and climate; and, second, the work of the orchardist in handling his soil and his tree.

The *possibilities* of crop depend on the natural conditions. *How much* of these possibilities is realized depends on the work of the orchardist.

There is no doubt that natural conditions in California are well suited to the profitable growing of olives. This does not mean, however, that all parts and all locations are favorable. The extraordinary yields, extraordinary both in quantity and quality, in special cases, demonstrate that some parts and some locations are as favorable as any in the world. On the other hand, numerous complete or partial failures indicate that some parts and some locations should be avoided by the olive grower.

After several decades of trial and error, of success and failure, the growing of olive trees tends to concentrate in certain regions. The absence of reliable, detailed, and especially, of recent statistics makes it difficult to determine exactly the extent and location of this concentration.

In other words, the possibilities of the crop depend on the natural conditions. Wherever olive orchards have been successful, more olives have been put out, without any thought of investigation, until the olive orchards commenced to increase in districts where their success has been demonstrated.

According to the census of 1910, there were nineteen counties in the state which had practically no olives. These are situated in the Sierras or in the extreme north. The other counties are credited with about 12,000 acres, of which 53 per cent were in southern California, 23 per cent in the Sacramento Valley, 14 per cent in the San Joaquin Valley, 7 per cent in the northern bay counties, and 3 per cent in the southern bay counties. San Diego was credited with the largest acreage (1600 acres), and Los Angeles, Sacramento, Butte and Fresno, each with a little over 1000 acres.

In 1917, according to the report of the State Statistician for 1918, the total acreage of the state had increased to 37,715, or over 200 per cent, with 22,346 in bearing. Without accurate statistics, it is impossible to state where most of this increase occurred. Large plantings in the Sacramento and San Joaquin valleys indicate that most of it occurred in these regions and it is probable that there was no increase, but, on the contrary, a decrease in the bay counties.

These figures indicate in a general way that locations at high elevations or too near the coast have not proved favorable to the profitable growing of olives. At high elevations the winter temperatures are dangerous and near the coast there is

a deficiency of heat and sunshine and a prevalence of black scale. Both these unfavorable conditions decrease as we follow the coast south, but do not disappear even in San Diego County.

In other words, the range of profitable olive growing is in the interior. They must be planted in the interior. In the north, until they commence to appear in the Sacramento Valley, there are few places where olives can be grown profitably, that is, until we come to the Sacramento Valley a hundred or more miles from the coast. As we go south, the line of olive growing gets closer and closer to the coast. The profitable growing of olives is not actually possible on the coast anywhere, even to the extreme south.

The most favorable regions seem to occur in the lower foothills of the Sierras bordering the Sacramento and San Joaquin valleys, and in southern California, though excellent orchards are found also in favored locations in various other parts of the Great Valley and even nearer the coast, especially southward. The climate needed is a high annual sum of heat, absence of spring and summer fogs, and minimum temperatures during winter not often below 18 degrees Fahrenheit.

The next factor to be considered is that of the soil. In this respect the olive is very tolerant. Excellent orchards are growing on steep hills and on level plains in soils varying from light sand to heavy clay loam, on soil underlaid by hardpan at three feet and on deep alluvial soils. Deficiencies of soil can to some extent be counteracted by methods of cultivation, irrigation, and fertilization. The best results, however, in crop and cheapness of handling, can be expected only on fairly good soils which are well drained and which can be abundantly and regularly supplied with water.

Of cultural problems, the principal are those which concern pruning, irrigation, and fertilization.

Those are the three collateral operations in which there seems to be the most difference of opinion and the most difference in practice in regard to the olive.

With regard to pruning, the impression seems to be gaining ground that we have been pruning our young trees too much and our old trees not enough. The evidence is convincing that pruning a young nonbearing olive tree weakens it and delays its development. This has been very clearly demonstrated for deciduous trees by Dr. Whitten and his associates. It is equally true for the olive. This does not mean that young trees should not be pruned at all. They must be pruned to give them the shape necessary for their profitable working when they reach bearing age. It does mean, however, that we should do no more pruning than is absolutely necessary to give the tree the required form.

I think it is a good general rule in pruning young trees, and especially the olive tree, that you cut off not more than is absolutely necessary to give the tree the required form.

If you take the Mission olive and give it no pruning at all, it will naturally take a suitable form; and a suitable form, as I take it, is such a form as will make it possible to cultivate it easily and will make it possible to harvest the olives economically, and at the same time will give you an opportunity to have as large an amount of fruit surface as possible.

Experience seems to show for the most part, trees will form naturally with those three conditions, that it will be easy to cultivate, it will be cheap to harvest, and it will be a larger expanse of fruit surface. The form will develop with those three conditions present, forming what is known as the vase formation of trees. That means that the tree has more or less of a short trunk, two or three feet of free space, with the branches spreading at an angle of 60 degrees from the surface of the ground. So that, if you draw a line across the tree from side to side, it will make an equilateral triangle. From that the tree should spread out and hang its smaller branches down. I think that is the best general form we can attempt to get with the olive trees to produce the most fruit. The Mission olive tree naturally takes that position, if we do not prune it at all. All that there is to do is to remove any branches which do not conform with that equilateral triangle formation.

Most olives, the Mission especially, naturally take the most suitable form; that is, a central trunk with symmetrically placed branches rising in a vase form at an angle of about 60 degrees with the surface of the ground. All that the pruner has to do in such cases is to remove any branch which tends to take too nearly a horizontal direction or which crosses over from one side of the tree to the other. Twigs or small branches less than a quarter of an inch in diameter

should not be removed as most of them will not develop into large branches. On the other hand, ill-placed branches larger than this should be removed as soon as possible, because the larger they are when removed, the more harm their removal causes by depriving the trees of the work of their leaves.

In other words, we must not remove a leaf unless we have to. And if you have to remove a branch, remove it before it has leaves because when you remove it you take off the leaves and the larger the limb is, the more leaves you take off and you will delay the development of the tree.

I saw a row of Mission olive trees that had just been set up. They were six years old when I saw them and I was told that they had never been pruned unless, perhaps, when they were young, the first year or two. Perhaps, some small branches were cut off near the bottom. The branches were from one to two feet high. The rest of the trees had never been pruned at all. Nearly all those trees were in perfect shape as far as the scattering branches were concerned. They had just the right measurements and the right distribution. Those trees had been increasing in size and increasing in strength through their trunks and had been generally brought into bearing stature without subsequent pruning.

If he is governed by these ideas the pruner may not have to remove a single leaf or twig from a large proportion of Mission trees until they are four or five years old. The removals from the rest will be very small in the great majority of cases. At Davis, in pruning Mission olives in this way at the end of their second year's growth, the total weight of pruning removed from twenty-four trees was only half a pound. From twenty-four similar trees pruned in the usual way, thirteen and a quarter pounds were removed.

In other words, in reference to the twenty-four Mission trees at the end of the second year's growth, it was found necessary to remove only half a pound of material from the branches, which means, I take it, half or a dozen small outgrowths from near the base of the tree. And the trees have survived as they should have. That would not occur probably with other varieties with less regular habits of growth.

With less regular and more drooping varieties, such as the Manzanillo, more pruning will be necessary. The amount of pruning necessary in such cases, however, can be much diminished by staking and tying. It is better to preserve a branch by tying it in the desired position than to remove it and wait for a better placed branch to develop.

Two or three years can often be saved by this method in bringing a tree to bearing size and shape.

So much for young trees. When a tree arrives at bearing size, other considerations will modify the nature of the pruning. When we prune any trees, our whole object is to prune in such a way as to make that tree develop to the size and shape we want as quickly as possible.

In order that an olive tree shall bear good crops, certain conditions are necessary. These are:

1. A moderate growth of new wood every year. We know by experience that if we have to have a new growth in one year, we shall have but very little crop. We know also, if we have a small growth we will either have a good crop or a crop of very small fruit. Which do we want to have? We can not have a moderate growth every year. That is why this year we have a heavy crop and the next year a lighter one. We want a moderate growth of new wood every year and we govern ourselves accordingly.

2. Exposure of this wood to air and light. That is, the new wood which develops and remains in the tree. We must realize that too much shade does not produce fruit buds. If it does the fruit is not set and the crop is lacking.

3. Equal distribution of this wood over the whole tree. In other words, we should have as large a fruit surface on the tree of a given size, as is possible.

These conditions can be obtained only by proper annual pruning.

There is a long-standing dispute among olive growers in California—less in California than in Europe—whether olives should be pruned every year or every third year, or every fifth year. The general tendency is, the more the subject is studied, to come to the conclusion that regular annual pruning is necessary for the best results.

Where the young olive tree has reached a height of ten or twelve feet, if it has been pruned in the way recommended, it consists of a short trunk of two or three feet, from the upper part of which arise a number of main branches, each furnished with numerous side branches, twigs, and leaves.

Such a tree is capable of producing a good crop. It has the correct form and abundant bearing wood, but the branches and foliage are too dense to allow of the proper setting and development of the fruit.

The two methods of pruning are to cut out the stems, and cutting back. You either cut out the whole of the branch or twig, or prune it right down to the roots or the origin of the branch, or to the trunk or main branch from which it rises. That is thinning out. Cutting back is that method by which you cut off a portion of the branch, take off a part of its length—one-half, two-thirds, or a third—as the case may be.

The pruning this year should consist therefore entirely of "thinning." First a number of the main branches should be removed at their origin on the trunk or on another main branch. The cuts should be made close so that no stub is left and the larger wounds should be made smooth with a sharp broadaxe or a tool specially made for this purpose.

In deciding which branches to remove, the form of the tree should be considered. Usually, one or more large branches must be removed from the center to open it up to light and air. This will give the tree a vase-shaped ring of branches which should be as evenly spaced and arranged around the circle as possible.

If this ring of branches appears too dense, that is, if there is not abundant space between them for light and air, some should be removed. A normal tree at this pruning when finished will have from four to eight main branches. If the branchlets, twigs, and foliage still appear too dense, this thinning out process should be applied to them.

In nearly all cases a twig or a branchlet or a branch should be removed entirely or left of full length. Occasionally it is necessary in shaping the tree to cut back a branchlet to a strong side branch growing in the required direction. This should not be done to strong upright or central branches. All these, if left, should be allowed their full length. The cutting back of a side branch should be done only when strictly necessary and only on low branches on the outside of the tree.

A tree, after pruning in this way, will consist of a low trunk from which rise a number of main branches spreading symmetrically at an angle which permits of close cultivation. These branches will be large enough in the season. They will be smaller and more pliable in the upper part so that when the crop becomes heavy they will tend to bend outwards, giving the tree the low spreading habit which is necessary for economical harvesting and to allow of the proper sunning of all parts. The branches will spread at a height sufficient to allow of the passage of horses and cultivators.

The later annual prunings of the bearing tree are governed by the same principles: First, remove ill-placed branches, that is, those which interfere with cultivation or cross over from one side to the other. Second, if this does not open up the tree sufficiently to the sun, remove some of the main or secondary branches where they appear too numerous. These removals should be made with care to preserve or improve the spreading vase form of the tree and to distribute the foliage as evenly and symmetrically as possible in all parts. Third, open up all dense masses of twigs and foliage by thinning out a sufficient proportion of the twigs.

The thinning of branches is best done with a good pruning saw; the thinning of the twigs with a one-hand pair of grape shears. The two kinds of pruning are best done by two sets of pruners or as two separate operations. The removal of branches requires much skill and judgment; the thinning of twigs is easily taught to any good workman.

How much a tree should be opened up, how many branches and twigs removed, can be stated only in general terms. Experience and skill on the part of the pruner are necessary.

As the objects of the thinning are to allow the sun to reach all parts of the tree and to promote the annual growth of healthy new fruit wood, these objects should guide the pruner in determining how much material to remove. However, if the first object of opening up every part of the tree to the sun is accomplished, the second object of new growth will usually follow.

The Tractor Making Check Rows: Durham Land Settlement.

Friday, November 14, 1919.

Morning Session.

Mr. H. C. Dunlap (San Jose), presiding.

The Chairman—I will begin the program by calling on Professor Howard, who is here in place of Professor Whitten, to discuss the subject of "The Effects of Irrigation, Pruning and Spraying as Factors in Frost Control." (*Applause.*)

Prof. W. L. Howard (Berkeley)—MR. CHAIRMAN, LADIES AND GENTLEMEN: I am sure you will agree with me that I am a very poor substitute for Professor Whitten in presenting this subject to you today. You need his personality to accompany the message that he desires to give you, in order to better appreciate it. Unfortunately that will be lacking.

(*Professor Howard then read the following paper*):

FROST CONTROL AND RELATED FACTORS.

By J. C. WHITTEN,[1] Berkeley, California.

Heretofore we have thought of protecting plants from cold only by direct methods, such as covering or sheltering the plants or by orchard heating, to raise the temperature of the surrounding atmosphere. This conception was based upon the accepted belief that a given kind of plant inherits a given degree of hardiness; that there is a "critical temperature," above which the plant will live, without injury, and below which the plant will be injured or even die. Certain kinds of plants are notably hardy or resistant to injury from cold; others are notably tender and subject to injury, even in relatively mild climates.

We now know that while the above factors are true, in part, they do not explain the whole truth in determining the resistance of a plant to cold, or to drought or to heat or to any other environmental influence that may favor or oppose the health and safety of the plant. To emphasize this statement we only need to call attention to the fact that a given variety of fruit tree may safely endure low winter temperatures, while it is dormant, or at rest, that it may be injured by a mere frost, after it has started growth in spring, and that a sudden frost may kill it after it has gotten into the accelerated growth of the warmer summer.

The state or condition of a tree at a given time; its degree of ripeness, and rest, or its degree of activity and growth, govern largely how much cold or other unfavorable influence the tree may safely endure.

We should get in mind the fact that a fruit tree is a living, sensitive, plastic, shapable thing. In developing its growth it responds to every outside influence that reaches it. Everything we do to it makes it different from what it otherwise would have been. Every cultural practice, such as pruning, fertilization, tillage or irrigation, applied to the tree or its soil, causes a response which makes the tree either hardier and more resistant, or tenderer and more susceptible to injury. Let us understand why.

First, let us outline the more important phases of the annual cycle of growth and development of a fruit tree. The tree puts out its leaves (and blossoms) in spring. This new growth is supported by plant food reserves (mainly starch or sugar) stored in the tree. Except for the presence of this stored reserve supply of plant food the tree could not put out its leaves.

As soon as the green leaves are put out, they become the source in which further supply of plant food is elaborated (or digested) to supply the daily growth and development of the tree and its fruit. Crude sap, taken in by the roots, is helpless to build new tissue or support further growth, until it is digested in the leaves. From the leaves the digested plant food is distributed, through the growing layer, to all parts of the tree, where it builds up new growth. Digestion of plant food can go on in the leaves only in the presence of the green coloring

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matter and of sunlight. Crude plant food is carried to the leaves and digested plant food is distributed from the leaves, dissolved in water, or sap.

The main length growth of branches and the formation of additional leaves normally should take place during the first few weeks of spring and early summer. So long as plant food, digested daily in the leaves, is being used up largely in promoting rapid length growth of branches and formation of more leaves, just that much less remains available to nourish and develop the fruit crop, the blossom buds for the following year and to store for winter in the tree.

As soon as length growth and leaf formation slows down, more digested plant food becomes available to accelerate rapid growth of the fruit, to develop blossom buds for the following spring and to store plant food reserves in the tree for the coming winter and spring. This emphasizes the desirability of spraying for red spider and maintaining green, healthy leaves to digest plant food throughout the summer and fall.

Studies made at the Missouri Experiment Station show that normally the sap of a fruit tree is least concentrated (contains the least sugar and digested plant food) during the period of rapid length growth in spring and early summer. Sap becomes more and more concentrated after length growth ceases. The supply of plant food reserves becomes greatest as the tree goes into winter condition.

The earlier a tree finishes its length growth the more concentrated its sap becomes and the more abundant its supply of plant food reserves. The more concentrated its sap, the more cold the tree will stand either in winter or during spring frosts. In one plot, peach trees which had continued rank length growth until overtaken by frost in autumn, had all their flowers killed on a night during the following spring, at a temperature of 27 degrees. The following night the temperature dropped to 22 degrees. An adjoining plot of trees which ceased length growth early in the fall, but which maintained healthy mature leaves until frost, endured this lower temperature safely without injury to their blossoms.

The merits of the new system of pruning, now being advocated, are better understood in the light of the above facts. The prominent feature of the former standard system of pruning is that the trees are severely headed back each winter. As a result, rank new growth is stimulated at the top of the cut-back branches. This rank, tender growth continues to lengthen and to make new leaves throughout practically the entire summer. This prevents early storage of plant food reserves and concentration of sap in the tree.

In the new system of pruning, the main limbs are established as early as possible. Once they are established they are not subsequently headed back. They are pruned by thinning out surplus limbs. Not being headed back, their length growth slows down. Length growth ceases early and terminal buds form. Storage of plant food reserves begins early. The tree accumulates a more concentrated sap. Better development of fruit and fruit buds becomes possible. The tree becomes more resistant of cold.

Trees severely headed back call for more moisture, or are less able to endure drought, during the following summer. The rank, new branches and leaves are soft, tender and succulent. This condition continues throughout the summer. They evaporate much water. The rank growing branches and leaves toward the top are able to draw water out of the leaves and fruit on the twigs below, whenever the water supply becomes inadequate in the soil. These rank growing parts above rob and shade out growth lower down on the tree.

Where the main limbs are not headed back, rank length growth at the top of the tree is not stimulated. Shorter growth of branches is about equally distributed in branches up and down the entire tree. Length growth ceases early. The tree early attains a concentrated sap and stores plant food reserves. These slow-growing limbs and leaves become firm in texture and evaporate but little water. There are no rank succulent upper limbs to rob or shade out the parts below. The leaves are not likely to draw water out of the fruit in time of drought. The concentrated sap gives up its water less readily. Such trees will endure more spring frost or more drought due to their better ripened or perfected tissue and their more concentrated sap.

Judicious summer pruning may be understandingly practiced. Indiscriminate summer pruning may severely weaken the tree. The removal of mature limbs which have ceased length growth, or of leaves that are healthy and firm, reduces the amount of plant food that may be digested and stored during the remainder of the summer. If summer pruning is severe enough to induce the production of new, tender twigs and leaves, this draws upon the stored plant food reserves and

results in a thinner, weaker sap, just when the tree should be storing instead of using up stored food.

Judicious summer pruning consists of the removal of any surplus, tender, succulent water sprouts that are growing where they are not wanted. Any permanent limbs that are continuing length growth too late, may be checked in their growth by clipping them back. Dead, broken or diseased parts, should be removed.

So long as trees can secure ample water to supply their leaves, it is not desirable to reduce the leaf surface more than to check length growth of late growing limbs. If drought is severe and trees are evaporating more water than can be supplied, evaporating surface may be reduced by judiciously removing the more tender, succulent parts, which are least needed as permanent limbs of the tree. Tender, soft, new leaves evaporate many times more water than older, firmer leaves that formed early in the season. The older, firmer leaves, if healthy, and which take on a dark green color, are more serviceable in the elaboration of plant food reserves. The green, soft, succulent leaves on a tree have the power of drawing water out of green, growing fruit during a dry time. This is because the sap of the leaves is more concentrated (contains more sugar and plant food in solution) than that of green fruit. Once the fruit begins to ripen its juice becomes more concentrated, and can draw water from the leaves when both leaves and fruit can not be adequately supplied.

As a result, green fruit often stands still in its development during a dry hot spell in summer. The leaves may show no sign of drought if they can draw water enough from the green fruit. Any treatment, such as heading back in winter pruning, which favors rank succulent leaf growth, favors withdrawal of water from the fruit during dry, hot days. If, on account of inadequate water supply, the ripening fruit begins to draw water from the leaves and thus increase in size rapidly, the tree is unable to produce and store up adequate stored plant food reserves for winter and is less resistant to cold.

Thinning the fruit, when the trees set an overload, is important. A tree may not be able to mature an overload of fruit and at the same time furnish the plant food necessary to develop fruit buds for the following spring. Furthermore, the overloaded tree can not store up an adequate supply of starch and sugar to render the buds strong and to endure frost or cold weather at blossoming time the following spring.

Spraying to keep down red spider or diseases that injure the leaves is important. Healthy leaves throughout summer and autumn digest and store plant food, giving a concentrated sap which enables the tree to endure cold at the next blooming period. If the leaves are injured and fall early, the tree can not store up adequate plant food for winter, the sap remains thin and the blossoms subject to injury from cold the following spring.

Steady growth and development is much more favorable than intermittent growth. A soft, succulent, spongy growth in late summer or autumn should be avoided if possible. Such a growth uses up stored plant foods in the tree and prevents farther storage before winter. This weakens the tree and favors injury from cold the following spring.

Whitewashing young trees during winter is a means of protection. We now know that the coloring matter in the bark of young trees can absorb heat enough from the sun's rays on clear winter days, to raise the temperature of the buds and growing layer 15 degrees to thirty degrees above the temperature of the atmosphere. This high day temperature makes the buds and growing layer of the tree active and tender. As the sun goes down the tree cools to atmospheric temperature in a few minutes. The cells of the plant which have become tender during sunlight may be injured by a sudden drop to the freezing point at night.

If the young tree is kept sprayed with whitewash during winter, the white surface reflects instead of absorbing the heat rays of the sun; the tree remains at atmospheric temperature or two or three degrees below during the day. The buds and growing layer remain dormant and are not injured by cold nights.

The fluctuating temperatures between day and night break the winter rest period of the tree. Whitewashing sometimes prolongs the actual rest period a month or even more. Fluctuating temperatures between day and night not only make the tree tender, but stored plant food reserves are actually used up and wasted. The tree which is protected by a good coat of whitewash retains a more concentrated sap with lower freezing point. It will stand more cold in spring due to its prolonged dormancy and its greater vigor.

A good whitewash which will stick may be made by using—

7 pounds of unslaked lime;
2 pounds of sulphur;
1 pound of salt.

These should be slaked together; the heat of the slaking lime acts on the salt and sulphur to make a wash that will stick. If a little skimmed milk is added to the mixture after it has cooled and when it is being diluted to apply to the trees, it will stick still better.

We now know that sunscald of young trees takes place mostly in winter though its drying effect does not show up until summer. In summer the growing parts of the tree are cooled by the water taken up from the cool soil and evaporated in quantity by the leaves. On a hot summer day when the thermometer registers 105 degrees, the temperature of a young tree which is evaporating water from its leaves may be somewhere in the eighties, which is a good summer growing temperature. Whitewashing in winter prevents sunscald of exposed parts.

Recent investigations are throwing some light upon what is taking place inside the tree. An understanding of factors which favor or oppose succulence or maturity of leaves and of wood; dormancy or activity; uniform or fluctuating growth; the storage or using up of plant food reserves; the fluctuation of winter and summer temperatures within the tree and the relation of cultural methods to modification of these factors will enable the thoughful grower to handle his trees so as to oppose injury from frost and drought.

The Chairman—We will now have the pleasure of hearing Prof. F. J. Viehmeyer on "Orchard Irrigation."

Address of Prof. F. J. Viehmeyer.

MR. CHAIRMAN, LADIES AND GENTLEMEN: It seems to me that the title of the paper just read does not do justice to it; of course, it related especially to irrigation and it joins the title to pruning and spraying as factors in frost control.

The question of the time and frequency of irrigation and the amount of moisture necessary at a definite time in helping trees in their growth, is certainly one factor of frost control concerning which the fruit growers need advice and instruction. Dr. Whitten's paper has so thoroughly explained the physiological phases of that problem that I merely attempt to call attention to some of the practical aspects of the subject.

In the irrigation seasons, for the conservation of water in the citrus region, it is necessary to use water at definite intervals of four or six weeks and in many cases this, in no way, meets the needs of the trees. Nevertheless, that practice is pretty well established. The conditions of orchards are varied and we do not find such uniformity as the time of irrigation suggests. It is a well recognized fact that late summer irrigation causes premature growth and this succulent growth is dangerous for early fruits. It is also being learned that it is dangerous to allow trees to get into the winter period in a dry soil so that when irrigation is given in the latter part of October or November the injury to the immature fruit is one of the causes of the winter killing of the tree. Also, we know that the dry, cold wind takes moisture from the trees and they are not able to recover themselves when the soil is dry, necessitating winter irrigation.

Professor Smith, in Bulletin 218 of the California College of Agriculture, points out that trees may suffer from lack of moisture, particularly the apple, and they suffer also from early irrigation. He, also, emphasizes the need of irrigation for walnuts and the McLaughlin apple of Utah; he points out the necessity for co-relating the moisture to the

condition of the twig and applies that also to peaches. The Experimental Station is working with apples in Idaho and they have reported the same results. We have, also, some experiments going on with irrigated orchards, particularly deciduous fruit orchards, but we are not at this time prepared to come to any definite conclusion. We have not enough means at our disposal to do what we would like to do but we intend to enlarge the scope of this irrigation section and in two years we hope to give the Agricultural Department suggestions along that line.

Dr. Whitten points out that there are three periods in which particular attention should be paid to soil moisture and irrigation. First, the period in which rapid wood growth takes place. He also insists on having sufficient water when the fruit is making rapid growth. I think it is known among deciduous fruit growers that our September rain last year was largely responsible for the large crops this year, so it is definitely understood that irrigation after fruit is off the trees is necessary.

Now the question of the amount of moisture needed in the early part of the season is not how much is needed, but how little is needed.

It is true that in most of our valley areas the tree starts into the growing period with sufficient moisture. There is no arbitrary rule to be laid down. It is up to each individual orchardist to determine the condition for himself.

In the Santa Clara Valley, water being available in winter time, it came to be the practice to irrigate copiously in winter months. In other deciduous fruit sections that practice is restorted to, but all orchards can not be irrigated that way.

In the Santa Clara Valley, we find some tracts without sufficient moisture and then you find as much as ten feet in others, or as much as the capillary capacity can stand. There is a very great difference, but the extra amount furnishes underground water, which is later pumped. I thank you. (*Applause.*)

The Chairman—At this time Prof. E. R. de Ong, of the Division of Entomology of the College of Agriculture, Berkeley, will make a few remarks from the standpoint of red spider control as well as fruit resistance.

(*Professor de Ong then read the following paper*):

THE RED SPIDER.

By E. R. de Ong, Davis, California.

Red spider is the most serious orchard pest of the Sacramento Valley and, to a varying extent, in other parts of the state. The wide range of host plants and the severity of their attack makes them an important factor in a large part of the orchard districts of the state. We may include under the term "red spider" the three or four common plant mites, whose feeding is of a similar type. If so, we are speaking of a pest that is found to a certain extent in almost every deciduous or citrus orchard of the state.

The insect pests of our orchard, whose feeding is similar to red spider, such as scale insects and aphids, are not usually so injurious, because they feed mostly on the elaborated plant food contained in the sap and not to so great an extent on the cholorphyll. The injury caused by these insects is through the extraction of large quantities of water and food prepared for the plants use and possibly the injection of a toxic material which is poisonous to the plant or to the smutting

of the fruit. Examples of the latter types of injury are the San Jose scale, the purple aphis of the apple, the European fruit scale. With the exception of insects which inject poisonous materials into the plant, it is possible for most trees to support a large number of sucking insects, unless the tree is already suffering from drouth. But in the latter case, the additional drain on the water supply of the tree may become a serious factor.

The red spider, however, not only extracts the sap but also the chlorophyll (the green coloring matter of the leaf and young bark). Dr. Whitten has been showing us that a tree without chlorophyll is in a weakened condition, incapable of manufacturing its own food in sufficient quantity for its needs, and from the nature of the plant, unable to utilize such material from any other source, providing it was available. Hence our orchards while undergoing the strain of maturing a crop, manufacturing starch for present needs and for next year's buds, and storing food in the sap, are depleted of the very organs which alone are capable of supplying this need.

We have been told at various times by Dr. Whitten that the dark green, thickened, older leaves of the center and lower part of the tree are of more value in the manufacture of sugar than the newly expanded leaves, because they contain more chlorophyll and by reason of their thickened cuticle evaporate less water. Here again we see the extreme danger of red spider attack, for it is on these leaves that we usually find them most abundant, and the paling effect of their presence most evident. Possibly the greater abundance of chlorophyll in these leaves is the cause of their locating in this part of the tree. Insects which are more of sap feeders such as thrips and aphids will be found on the newly expanded leaves, which contain relatively a small amount of chlorophyll, but are turgid with sap, and hence are of less value to the tree than the dark colored ones upon which the mites feed.

The results of red spider attack, then, are primarily, the reduction of the amount of elaborated sugar and starch, and secondly, the possibility of defoliation with sunburn is a natural consequence. This absence of foliage persists throughout the remainder of the year, unless new leaves are grown at the expense of earlier stored food. The checking of sugar manufacture in midsummer may mean a reduction in the amount of sugar and other nutrients present in the prune, etc., with a resulting inferior crop. Second, the buds for next year's leaves and flowers, which are ripening at this time, will have an insufficient supply of stored food and hence will not make as strong nor as rapid a growth. The quick growth which a tree makes in the early spring is possible only by reason of feed stored the previous year. Third, the attack may become so severe that the tree is unable to provide food for its immediate need. Then it is quite probable that food stored earlier in the year will be translocated and utilized immediately, thus reducing next year's supply of food. Fourth, and lastly, it remains for Dr. Whitten to point out the possibility of another serious injury, which most of us had not recognized. I refer to the lowering of the amount of sugar in solution in the sap, thus rendering the tree more susceptible to frost injury. From what has been said, it will be seen that the feeding of red spider would tend to cause this very type of injury and thus put the tree in a more serious condition than we had thought for.

These points, I think, will serve to emphasize the need of an early attempt to control the spider. This work should be done early in the season before injury becomes noticeable. Where injury has been known to be common the sulphur should be applied early in the summer, even though the spider has not been noted.

The Chairman—We have with us Mr. E. M. Sheehan, of San Francisco, who has been affiliated with the Grape Growers' Protective League of the state, and I believe he is quite able to start the ball rolling on this subject. (*Applause.*)

(Mr. Sheehan then read the following paper):

EVAPORATORS FOR FRUIT DRYING.

By E. M. SHEEHAN, San Francisco, California.

The drying of fruit by artificial heat is an absorbing study at the present moment, and I venture the prediction that during the coming year greater strides will have been made in this particular science than in the past ten years. California, richest of all the states of the Union in horticultural wealth, will find herself conducting the most extensive practical experiments in the evaporation of her fruits, and the eyes of the world will be focused on the results to be achieved.

Necessity is the mother of invention, and the demand comes at this time for improved ideas in methods of dehydrating a very considerable proportion of our deciduous fruit crop. More than anything else, the salvage of the wine grape crop and the culls of the table grape vineyards, deprived of their usual outlet by the effect of prohibition laws, has called for the development of other channels of distribution and made quick action necessary.

There have been other contributing causes for diverting attention to drying processes. An annual crop of 400,000 tons of grapes, suddenly confronted with the necessity of seeking new markets, and requiring extensive transcontinental transportation service, finds that service woefully inadequate and with little hope of correction in the next three years. We have just finished a season of disastrous results in the matter of the shipment of fresh grapes out of California. The transportation service given to shippers of grapes was the worst in the history of such commerce, and it was due principally to the fact that two classes of grape shippers were asking for refrigerator cars. In former years it was the table grape shipper only who called for these cars. This year, on account of the prohibition of wine-making for beverage purposes and the consequent closing of most of the large wineries, the wine grape growers were confronted with an unprecedented demand in the East for wine grapes. There was the general but mistaken impression that wine could be lawfully made in the homes, and the Italian population of the country was willing to pay even fabulous prices for fresh wine grapes in the great eastern centers of population. All through the shipping season there was a greater demand for cars for wine grapes than for table grapes. The consequence was that neither applicant was supplied and great dissatisfaction prevailed. All sorts and styles of rolling stock, from ventilated cars to ordinary box cars, were loaded with perishable fruit and sent on long journeys across the continent. Much of the fruit arrived in badly damaged condition, and the season has fully demonstrated that there are not enough available refrigerator cars in the country to carry out of California in September and October the normal table and wine grape crop in fresh form.

Something therefore must be done before another season is upon us. The question as to who has the best right to first use of the available refrigerator cars —whether it be the wine grape grower or the table grape vineyardist, with both parties having an equally perishable product—will be argued pro and con with merit on both sides, and so long as both insist on cars there is bound to be a shortage and consequent loss.

I do not pretend to say that one class or the other should be favored in the matter of distribution of service. If there is not at least an equal distribution of cars to both classes, and either one element or the other is favored by priority rights, then we would have to conclude that there would be no encouragement offered to the development of new markets for new perishable products that were in sudden demand for new uses. I do argue, however, that the drying of grapes and the making of sirup would greatly relieve an intolerable situation the coming season. The crop of one class of vineyardist should not be saved at the expense of that of another class; but a way should be found to save both crops and both classes by intelligent preparation.

Before speaking directly to the point of my subject—that of artificial drying—let me suggest also that interest in this work of processing has come about by fear of inclement weather in sections that ordinarily depend on evaporation by the sun. Experience is the best teacher, and we found ourselves in fear and dread a year ago when untimely rains visited the interior valleys and destroyed millions of dollars of dried fruit on the trays in the fields.

So, for these reasons, and because of the apparent unlimited demand for our dried prunes, apricots, peaches, pears, figs and other fruits at marvelously remunerative prices, as well as for the important thoughts of promptness and cleanliness in the processing of our dried fruits, we turn our attention to improved methods in artificial drying, with the hope that those who have new ideas and appliances will seek to demonstrate them in all of our horticultural sections before the next crops are ready for harvest.

It is not my purpose to extoll the virtues or particular merits of any special artificial drying process for fruit. In passing, if I mention any of them, it is not with the thought of promoting or advocating any one plant as the only and the best solution of the drying question; but rather for the purpose of suggesting meritorious features and having my auditors reach their own practical conclusions, for most of the producers of dried fruits are more capable of judging their own needs than I.

What we need chiefly in drying plants is uniform temperature in all parts of the dry room, and this feature, in my judgment, will always require the development continuously of warm air, plenty of it, the proper circulation of it and the loss of a very large amount that has never reached a dangerous moisture saturation point. I believe in the theory of sacrificing fuel if necessary rather than attempting to use the hot air to the limit of saturation. In dryers that have come under my observation, I believe I have seen the best results where the conservation of warm air was considered of minor importance; but I should say here that I have seen tunnel construction so arranged that partly cooled and saturated air could be carried back into succeeding tunnels and lessen heating expense by mixing with new and hot air generated along the line of circulation by other heaters. If unused and wasted hot air is a considerable loss, I am inclined to the belief that it had better be considered as an expense of operation and be tolerated, for at best it is not a large item even at the present price of oil fuel.

During the past several months it has been my pleasure to examine a number of evaporators and to watch the results obtained. I believe there are many efficient plants for the drying of apples, as this particular fruit is perhaps more easily handled than most others. As a matter of fact, all the fruits that are sliced or broken in advance of the drying process are more easily and readily dried in a successful way that fruit which is dried in whole form such as prunes and grapes. It is not misstating the situation when we say that a plant which will turn out a successfully dried prune or bunch of grapes, will properly take care of most of the other fruits in varied lengths of time, according to the bulk or thickness of the particular fruit that is being processed.

The time required for drying and the capacity of the plants are very important features, particularly in prune and grape sections of California, where climatic conditions do not permit of drying in the open by the sun. Sonoma and Napa counties have made considerable strides in the last few years in the culture of the prune and pear. The grape crop of both these sections has always been tremendous, aggregating perhaps 125,000 tons each year, and all of them wine grapes. It will take artificial means to dry this fruit successfully, as normally the sun may not be expected to do the work. What, then, must we have in the way of plants to care for such an annual production of fruit, or even a part of it? The question leads directly to the subject of artificial drying as one of the means of rendering the crop at least temporarily imperishable, if a considerable quantity is not to be shipped out of the state in fresh form.

Here another thought, not to be hastily dismissed, is that of converting a portion of the grape crop into sirup, using the wineries as sirup plants and equipping them with necessary additional machinery in the way of boilers and vacuum pans. For the moment, when speaking of the grape crop, I digress from the subject of drying fruit to that of evaporating water from the juice of fruit and reducing such juice to a concentrate possibly one-fourth of its original volume. I would like here to throw out the suggestion, in thorough accord with the views of Professor Cruess of the University of California, that much thought and attention should be given to this processing of the grape. The resultant product has a three-fold use and the sirup base is free from outside contamination and decay. This is not so with raisins. They can not be held indefinitely, while, on the contrary, sirup needs no preservative and holds itself for future uses without fear of deterioration. Properly made, it is ideal for the table. Secondly, if diluted with

water, it becomes unfermented grape juice if made and used at the time of making or diluting. Finally, if winemaking is permitted and desired, it is readily converted into wine by allowing time for natural fermentation. I have had the privilege of experimenting in this direction and the result is gratifying. Let us not, therefore, forget this angle in connection with the salvage of the crop of wine grapes and table grape culls.

Getting back to the production of dried fruit, we find one of the most pretentious drying plants at the base of the range of mountains defining the east limits of Napa Valley and about four miles from the station of Yountville. The property is that of Mr. Clarence Grange, and the attractive location is called Stag's Leap. Mr. Grange, who is in attendance at this convention, with the assistance of Engineer Pierson, are pioneering some new ideas exclusively their own, in drying grapes, and they have only been in the business a little over two months. In that time, however, they have built a plant at an expense of possibly $40,000 that has attracted the attention of thousands of horticulturists of the state. It is doing excellent work but the originators make no pretentious claims. They rather seek and invite information and suggestion, but have really worked out their own salvation. As to whether or not they have successfully dried their wine grape crop is best answered by stating that every pound of the dried product has been sold at an attractive price. This fact establishes, at least temporarily, an unmistakable standard in artificially dried grapes. The production was at the rate of ten tons of raisins per day and the product was promptly sold. The Grange plant is the tunnel idea of drying, with heat supplied direct from the furnace flame after being mixed and driven by force fans through tunnels approximately 100 feet long. Mr. Grange welcomes an inspection by interested parties and he has in mind in a tentative way the building of his model of plant for community co-operative activities in drying fruits.

The Casey drier on the property of Mr. Fred Ewer at Rutherford is reported also to be very successful in work on prunes and grapes. It is built on the idea of serving the individual grower. Another large drier near Healdsburg is worthy of inspection and there are small plants such as the Banks of San Jose and other models that have been used with varying degrees of result in many sections of the state. The plant built at the University Farm at Davis was used during the season with good result and the product may be seen by any who care to examine it.

It would be impossible in this paper to discuss minutely the merits and demerits of the various drying plants that have been in operation. I think it best to advise a farmer contemplating the purchase of a drier to see what he is buying before making an outlay of money. Plants that many of us have never seen are coming into this market very soon from the North and East, and we should all have the opportunity of seeing them demonstrated on some sort of fruit. There is some little time ahead of us and we have ample opportunity to form intelligent conclusions. We need drying plants in this state, but we want the best, which means those that are most efficient and economical.

As a guide to those who are getting ready to install drying plants, I suggest the following thoughts in coming to a decision in the matter of purchase and selection:

How many tons of green fruit will you wish to dry?
What is the normal drying ratio of your particular fruit?
Having determined your probable output, what capacity of plant do you require, considering, of course, the length of your ripening period and the time required to dry each batch?
What is the cost of the fuel required and how much must you use each twenty-four hours?
What labor is required in the loading of each batch and what will be the cost of such labor?
Will it be necessary to shift trays or cars of fruit during the drying time of each batch?
Will your particular fruit require dipping or surphuring or both?
According to this determination, what will be the cost of erection of a dipper, rinser and sulphur house?
What will the caustic soda and the necessary sulphur cost you?
Have you electric power with which to connect and drive the burner and blower? If not, what will gasoline or steam power cost you?

Are you provided with storage bins for the dried product?
How many trays will you require and what type will you use?
What is the price of boxes for packing the finished product?
What is the market price of the product, or at what price may you contract its sale?
Finally, what is the plant going to cost you, erected on your property and ready for operation?
Would you prefer to build your own plant, or haul your green fruit to a community plant in which you had shares of stock, or which offered to dry your fruit at a set price per pound of fresh fruit?

This last thought is suggested because of the fact that there has been undertaken on the part of the Market Director of California, Colonel Harris Weinstock, the organization of a co-operative association among the wine grape and table grape vineyardists. The general idea is to process and market wine grapes and table grape culls by co-operative effort, and a recent meeting of representative growers at Colonel Weinstock's office disclosed the fact that there was unanimity of sentiment along these lines. There will soon be another meeting of the organization committee, and it is not unlikely that there may be developed within a comparatively short time another such co-operative growers' organization among grape growers, as now exists among the peach, apricot, pear and prune growers. Co-operative effort in production and marketing seems to be the spirit of the day, and the solution of many disappointments in farming.

In closing, allow me to suggest that inventive genius be directed toward finding a substitute for the dipping in lye solution of some of our fruits that require the checking of the skins before being dried. It would be better if we could do away with the lye dip and devise other and more satisfactory means of releasing the moisture from the fruit without injuring the quality of the dried product. I would invite discussion of this particular subject among other points that may be made.

Mr. Sheehan—MR. CHAIRMAN, LADIES AND GENTLEMEN: The discussion of this subject will, perhaps, be much more interesting than the reading of a general paper like this. I do not presume that anybody here will pose as an expert in the matter of dehydration or evaporation or anything of the kind; and I repeat that I don't, and although I have been asked many times to pass judgment on the artificial drying of grapes and prunes I have always been very frank in saying that my judgment on that particular topic would be worth nothing as there is really no standard to go by.

We have a standard for sun dried fruits, raisins, and sun dried prunes, but we really have no standard established in artificially dried fruits or raisins, and a standard will really have to be established by somebody or by some several persons who will dry artificially and successfully fruits, and whose fruit, so dried, will be bought, accepted and paid for in the market. That is what establishes standards in everything. It appears to me we shall simply have to wait and see what happens in the future. We know what has happened, to a small extent, in the past and we are now waiting the problems of the next year; we are trying to improve the drying process and I am very certain it will be improved.

On this subject I might dwell at some length, but we have with us Professor W. V. Cruess, who has taken a great interest in this matter, particularly in regard to the grape and prune industry, and I will call upon him to lead the discussion on this subject, at this time.

(*Professor Cruess then presented the following paper*):

DISCUSSION OF FRUIT EVAPORATION.

By W. V. Cruess, Berkeley, California.

IS AN EVAPORATOR NECESSARY FOR FRUIT DRYING IN CALIFORNIA?

Evaporators are of interest to California fruit growers from two standpoints: First, their use as an insurance against rain damage in the drying of prunes and grapes; and, in the second place, as a means of improving the quality of California

Figure 176. Demonstration of Viticulture Division's evaporator at Davis, under auspices of State Director of Agriculture.

dried fruits by the use of evaporators regularly for all fruits that may be dried in them satisfactorily.

That an evaporator is a good investment as a means of preventing loss from rain damage is conceded by all who have studied the problem carefully or who have suffered severe loss by early rains in recent years. One season's loss will, in a season such as that of 1918, more than pay for the evaporating capacity necessary to save the crop. The use of a five hundred dollar evaporator in one instance last season saved one hundred tons of prunes; this, of course, is an unusual case, but indicates the possibilities.

Whether an evaporator will pay under California conditions as a part of regular practice remains to be seen. If we take as an illustration a bearing fifty-acre prune orchard and compare probable costs and returns from sun and evaporator drying, we would, it is believed, have some such comparison as the following:

Five acres would be needed for a sun drying yard, while an evaporator would require about one acre. The dry yard could be used as hay ground in addition to its use for drying fruit and would perhaps yield five tons of hay worth $20 per ton or a total return of $100. If the evaporator is used, the four acres made available for prune growing by its use would probably yield four tons of prunes worth, at 1919 prices, $1,160.

The cost of sun drying and of drying by means of an evaporator are, we judge from available data, about the same, except for the cost of fuel used in the evaporator. To evaporate the prunes from a fifty-acre orchard would require about $300 worth of stove distillate; judging from our experiments at Davis during the past season.

Trays and dipping equipment for the above sun drying yard would cost $3,000. Depreciation upon this investment at 10 per cent per year is $300. An evaporator and dipping outfit to care for the above orchard would cost about $5,000. Ten per cent depreciation per year on this amount is $500.

Mr. Milo Williams of Live Oak was offered ¾ of a cent per pound more for his evaporated prunes than for his sun dried prunes from the same orchard. On 50 tons of dried fruit this would be $750.

Or, in other words, we would have the following comparative costs if we consider the labor cost the same in both cases:

Sun drying		*Evaporator*
	Fuel	$300
$300	Depreciation	500
$300		$800

The income would be—

Sun drying		*Evaporator*
$100	Value of hay from sun dry yard.	
	Value of fruit from 4 acres orchard made available by use of evaporator	$1,160
14,000	Value 50 tons dried prunes from sun drying yard at 14 cents.	
	Value 54 tons dried prunes from orchard where evaporator is used and at price of ¾ of a cent premium, or 14¾ cents per pound	15,930
$14,100		$17,090

Subtracting from these figures the cost of fuel and depreciation, we have for sun drying, $14,100—$300=$13,800, and for evaporator, $17,090—$800=$16,290, or a balance of $2,490 in favor of the evaporator if we consider all other costs equal in both cases and leave them out of consideration. If we assume that the evapo-

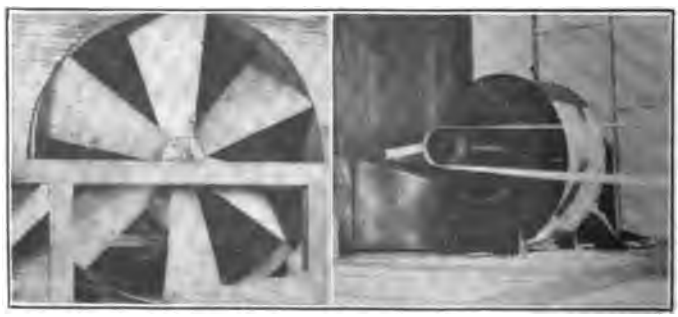


Figure 177. Types of fans: Left, a disc fan; right, a multivane fan (more desirable than disc fan).

rated fruit will bring the same price as the sun dried article then the balance in favor of the drier is only $1,680. If the four acres of land made available by use of the evaporator is used for hay only, and both kinds of prunes bring the same price, there will be a balance in favor of the sun dry yard of $500.

These figures are only estimates, but are believed to represent approximately the true situation. They would indicate that the use of evaporators would not materially alter the cost of drying in normal years; while their utility in seasons of early rains would justify the necessary investment.

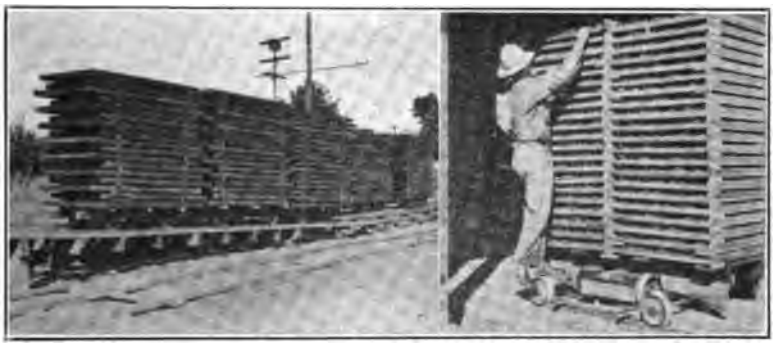


Figure 178. At left, ordinary 8-foot by 3-foot sun drying trays stacked on trucks for drying in an evaporator (Napa County). At right, car of loaded trays for evaporator at Davis. This type of tray is much superior to ordinary field tray for use in evaporator.

DO EVAPORATORS GIVE INCREASED YIELDS.

T. I. Casey, W. A. Banks and others believe that greater yields are obtained in the evaporator than by sun drying because a certain loss of sugar by fermentation occurs in sun drying. From our Davis experiments carried out by A. W. Christie, F. Flossfeder, and the writer, no definite conclusions can yet be drawn until moisture determinations have been made upon our samples, but present indications are that the yields were approximately equal by both methods.

RELATIVE QUALITY OF EVAPORATED AND SUN-DRIED FRUIT.

The Wann Brothers of Healdsburg and Mr. Milo Williams of Live Oak have produced dried prunes of finer appearance than the writer has seen made by sun drying, and this superior quality was reflected in the increased price offered for this fruit. Grapes dried in our evaporator at Davis possessed a great deal better color and flavor than the same grapes dried in the sun. Evaporated fruits are more free from grit, dust and other dirt of various kinds than fruit on trays in the sun accumulates. It therefore seems safe to assume that properly evaporated fruits are superior to the average sun dried article in point of quality and sanitation.

THE UNIVERSITY FARM DRIER.

This is fully described by Mr. A. W. Christie of our Division in the Journal of Agriculture for December, 1919, published by the Agriculture Club of the College of Agriculture, Berkeley. The drier consists of a tunnel about 32 feet long, 7 feet tall, and 6½ feet wide, with one set of tracks connecting to a transfer track at each end of tunnel. The tunnel holds 8 carloads of fruit of 42 trays of 3 feet by 3 feet size or about 1500 to 1800 pounds of fruit per car, or 6 tons to 7 tons per charge. The cars enter the cooler end of tunnel and emerge at furnace end. The furnace room is of concrete and contains two old boiler shells connected to several turns of 12-inch water pipe and 15-foot stacks. A forced blast stove distillate burner of Johnson type is used in one furnace and a California-Fresno gravity burner in the other. The air is heated as it is drawn by a fan over the pipes and furnaces. A 5-foot disc fan is located in the wall of the furnace room at the tunnel entrance and a suction fan of the same capacity at the outlet of the tunnel for the sake of comparing effectiveness of the two types of fans.

A small fruit dipping outfit of the Sutter Company "merry-go-round" type was used to dip the fruit. Dipper and evaporator were covered by an open shed. (See Figure 176.)

A concrete sulfur house capable of holding two cars of fruit completed the equipment. The State Commission of Viticulture purchased most of the equipment from a fund of $2,500 donated to the University by this Commission. The University furnished funds to pay for labor of construction and cost of operation.

SUMMARY OF DAVIS TESTS.

1. *Burners.* The forced blast burner was the more satisfactory, but the gravity burner gave good enough results to warrant its use in localities where electric power is not available for the forced burner. The forced burner burned without formation of soot while the tendency of the gravity burner was to form a considerable quantity of this objectionable substance.

2. *Fans.* Disc fans were used for suction and positive blast. The rate of drying and air flow was about equal with both types, but the suction fan gave a more even distribution of the air. From observations on either evaporators, it has been found that a multivane type of fan is much superior to a disc fan because it gives a greater air pressure, greater velocity of air, and correspondingly more rapid rate of drying. The multivane fan is more expensive for first cost but is far more satisfactory in every way. (See Figure 177.)

3. *Re-circulation of Air.* The drier was so equipped that all or any percentage of the air could be re-circulated. Contrary to expectations, re-circulation of 75 per cent of the air did not reduce the rate of drying, but caused a saving of about 50

Figure 179. Views of Oregon Tunnel Evaporator on Abshire place near Geyserville. Lower ends of tunnels are shown in view on right. Used successfully in 1918 for prunes.

per cent in fuel. In building an air blast evaporator this feature should be included.

4. *Temperature of Drying.* Mr. Christie found that 190 degrees Fahrenheit could be used for red wine grapes with safety while the grapes still contained moisture, but that caramelization takes places rapidly at this temperature after the fruit becomes dry. With care this temperature may be used safely with consequent cutting in half of time of drying as compared to usual temperatures.

5. *Sulfuring.* Fruits, including pears, peaches, apricots and grapes, were dried with and without sulfuring. It was found that fruits dried in an evaporator require only one-half to one-fourth as much sulfuring as those dried in the sun. This affords a means of greatly reducing the sulfurous acid content of dried fruits.

6. *Trays.* Screen trays were found to corrode badly in sulfur fumes, imparting a white encrustation and metallic taste to the fruit. The fruit stuck badly to screen trays. Solid bottom wooden trays caused excessively slow drying. Slat bottom trays of ⅛-inch strips were by far the most satisfactory in every way. They are cheaper than screen trays; more durable, do not corrode, and permit as rapid drying as screen trays.

7. *Dipping.* Wine grapes in most cases required a 3 per cent lye solution for 30 seconds at 212 degrees Fahrenheit to cause sufficient checking of skins. Undipped grapes dried less than half as rapidly as dipped grapes.

Many other interesting points were investigated but will be reported upon later. The Davis evaporator was successful and satisfactory and may well serve as a model for a small plant.

Fruit of the hardy, prolific jujube of China, grown at the Chico Plant Introduction Gardens, of the U. S. Department of Agriculture. They are edible in the fresh state and also form the basis of a delicious confection. (U. S. Dept. Agr.)

Packing of such tomatoes as that is prohibited by the laws of California, and when such fruit as that is detected on the markets it is seized and under due process of law the packer is prosecuted by the fresh fruit inspector.

Standardization in the case of tomatoes, then, means to the producer a sound product. It prohibits the sale of tomatoes packed in such a way that you are likely to get only fifty-two good tomatoes out of a box of eighty.

Now, in that same lot of tomatoes there was a box, the top layer of which contained twenty-six beautiful tomatoes; in the box, twenty-six on top and fifty-four on the bottom. Practically one-half the sides of the upper tomatoes was concealed. And the lower layers you could not see at all. If you bought the tomatoes by the box and a guarantee was given that you were getting the number of tomatoes that were actually exposed on the top, until the standardization law came into effect you had no guarantee. The standardization law provides that in the case of tomatoes there must not be a larger number of tomatoes in the lower layer than there is in the upper layer. In other words, this pack of tomatoes. twenty-six on the top and fifty-four on the bottom, violates the standardization law, because it contains a smaller number of tomatoes. You are buying by the appearance of those you can see, and you are getting much smaller tomatoes which are concealed.

Standardization prohibits the packing of fruit in such a deceptive way. Standardization, therefore, guarantees to the consumer an honest pack. The fruit exposed must be a fair indication of the remainder of the package or of the contents in every package.

Now, those same tomatoes are seized and held as evidence. People of these towns ought to have tomatoes. Therefore where tomatoes are proffered for sale packed in accordance with the standardization law and offered for sale, people will naturally assume they will be the same price and the same quality of tomatoes offered for sale at eighty cents a box where there are eighty in a box. But they may be packed forty on the top layer and forty on the bottom layer. If you saw the top layer or if you saw the bottom layer, it would make no difference. You have a fairly accurate idea of what you are buying. But it does not necessarily follow that standardization is going to prevent all deception in all cases by a dishonest pack or an unsound product. That would be asking too much of any law, to ask it to prevent the things it prohibits.

We have had for a good many years the most strict regulations and the most strict punishment for murder. But murder has continued; it has only been checked; it has not been prevented.

Standardization, once more applied to these tomatoes, is an endeavor to prevent the packing of tomatoes which are not a good, honest, marketable product; which are not fit for human consumption; which are not fit to come into competition with tomatoes produced by other growers.

Standardization, then, seeks to secure for the consumer full value for his money. It is not the intention of the act to stifle competition. It is not the intention of the state to affect prices by the standardization laws in any way.

I am reasonably sure of the truth of those statements because I was present at the various committee meetings of the legislature when these laws were under discussion and I know that those laws should not interfere with competition; that they should not touch in any way the law of supply and demand. It was the intention of the legislature to draw up a set of rules—if I may use that comparison —on which the business of marketing California products is based, so that the producers may meet each other on a fair and common ground, based on the quality of their product and where each is entitled to all the business that he can get; but where the consumer is protected from that form of competition which finds its outlet in a decrease of the quality of the goods concerned. That is the purpose of standardization: To bring all competition of our California products to a basis where the known quality and the known quantity is offered for sale at the prevailing market price.

Standardization, then, means to the consumer an honest pack and full value for his money. It does not of itself affect prices. It does not afford to the producer or dealer an opportunity to raise prices. And it guarantees to the consumer whether he buys after inspection or whether he buys in bulk, everything he has, that he has a court in which he can secure redress if he is sold produce which is packed in violation of the standardization laws.

The law of supply and demand regulates the price of all commodities. No amount of organization and no amount of competition can ever affect that principle. I think the men here who have talked on the value of co-operation the last two days have thoroughly demonstrated the fact that, after all, the one governing principle of our business is the law of supply and demand. The standardization laws regulate the quality of the goods, the quality of our California products. And it is then left to the economic conditions within our country and within our state and the chance of distribution—because sometimes it is a chance—to work out the ultimate price which the consumer must pay for his goods.

The Chairman—Mr. William A. Brink of Winters will now read a paper, "Standard Packs and Packages."

Mr. Brink—MR. CHAIRMAN, FRUIT GROWERS OF CALIFORNIA, LADIES AND GENTLEMEN: The writer arrived here by a process of elimination. The subject, standardizatjon of packs and packages, was originally assigned to Mr. Charles Virden, General Manager of the California Fruit Distributors, passed on to Mr. George Cutter, President of the California Fruit Exchange. These gentlemen having business engagements that would not permit of their attendance, both reassigned the subject and through a combination of unfortunate circumstances, the writer appears before you. Unfortunately, you are deprived of listening to men who are specialists in their line and who could speak with authority on this subject; most of you being orchardists, however, are more or less used to substitution. When one can't get a six-foot tray, one will use a two by three. On this basis I am here.

Most of the papers of this character are entirely too long; the audience becomes bored; those occupying the front seats find relief in sleep, those occupying the center amuse themselves by shuffling their feet, and those more fortunately situated in the rear gradually fade away through the exits. We have endeavored to minimize the contents of this paper. If the statements are too concise, I will be glad to answer any questions asked, provided my limited knowledge of the subject will permit me to do so.

STANDARD PACKS AND PACKAGES.

By WILLIAM A. BRINK, Winters, California.

In the sisterhood of states, California surpasses all others in the production of fruits, having produced in the last season 45,000 cars of citrus fruits, valued at $80,000,000, and 27,600 cars of deciduous fruits, valued at $35,000,000, not to mention the many millions representing the value of our dried products; and in a comparatively few years in which the industry has been developed, we have set the pace for the world to follow, not only in the growing of fruits, but in the standardization of packs and packages, until today the growers of the state are working under a standardization law that is held up as a model in other states, on account of its simplicity of structure, being comprehensible to any one who cares to read it, and on account of its easy adaptability in its practical application. You all know, however, that this is not a perfect law, and being a progressive body of people, you will make improvements in it from time to time.

Packages have become fairly well standardized. This standardization has been brought about by experience, it having been found that certain varieties of fruit carry to better advantage in packages of certain dimensions; and on account of the great volume of fruit moving from the state, growers, shippers, and carriers have adopted these certain packages as standard, otherwise it would be impossible to move with dispatch the vast quantity we now do under any other conditions. The Transcontinental Freight Bureau in its ruling sets forth the maximum size

that the carriers will allow for any variety and which may be entered on bills of lading by shippers as standard pack.

Cherry boxes, billed at 11 pounds	2¾	x 9	x 19¾
Peach boxes, billed at 21½ pounds	5	x 11¼	x 19¾
Crates—apricots and plums, billed at 26 pounds	5	x 16	x 17½
Grapes, billed at 28 pounds	5	x 16	x 17½
Pears, billed at 50 pounds	9	x 11¾	x 19¾
Los Angeles lugs, no billing weight	5¾	x 14	x 19¾

Any packages not conforming to any of these standards are billed at actual weight.

Cherry Boxes. At present there are half a dozen different styles and containers; the regular box specifications above take care of the row pack. The same box with eight cartons, takes care of the carton pack. Then we have the eight-basket crate, the twelve-basket crate, the pioneer lug and the Los Angeles lug. Well informed people tell us that all but two or three of these packages could be eliminated without harm to the industry. The standard cherry box, which is known to all the trade and which loads readily in mixed cars of fruits, and either one of the lugs, which generally contain fruit too small to make an attractive pack, should be retained. Cartons may be used to advantage for fancy fruit and early markets but most of the private sale markets do not care to pay the 20 cents differential for the cartons over the plain pack. There is no demand whatever for cherries in crate pack. The coast trade is well satisfied with cherries bulked in lug and will not pay for fancy packs.

Peach Boxes. Little need be said about the peach box, as it is now standard all over the state and varies only in depth due to the size of the peaches being packed.

Crates. There are at present four different styles of crates being used. The eight-slat crate, the peach style crate, the Fresno crate, and the California vineyard crate. The eight-slat crate is used in the Vacaville and Winters sections mostly. Growers in these sections are so accustomed to the use of this crate that they will not hear of any other. Its only advantage is the maximum amount of ventilation it affords. Its disadvantage is frailty, and on this one count it should be eliminated.

Peach style crates have solid sides and bottoms. They are used on the Sacramento River and in Placer County, almost exclusively. This is a very strong package and eliminates a great deal of breakage in the cars, thus keeping loss and damage claims down to a minimum. The ventilation is sufficient.

Fresno crates have solid sides and slat bottoms and receive their name from the locality in which they are largely used. The slat bottoms give the crate a little better ventilation than is possible in a peach style crate. They also make very strong packages.

California vineyard crates have solid sides and bottoms, the sides and bottoms being interchangeable. In these crates the bottoms are a little too narrow.

Of the four styles of crates, two could be eliminated, the eight-slat and the California vineyard. Fresno crates with solid sides and slat bottoms could be used in all grape packs and the peach style crates could be used on all tree fruits.

Pear Boxes. More trouble is experienced in pear boxes than in any other deciduous package. This is due to the fact that we have a great deal of weight confined in a small package and under a great deal of pressure. The average pear lumber is not of good enough quality to stand the strain, hence the heavy breakage in all our market reports. Growers should co-operate with the shipper and insist that the mills furnish us with better pear shook. A 20-inch cover is advisable; if the pears are properly packed, the bulge in a cover will take care of the extra length. We should also insist on the extra wide 1½-inch pear cleat and in every case would cleat the box top and bottom. The cleats on the bottom keep the nail heads from pulling through the wood after the pressure has been applied and the top nailed. This has been tried out this last season in several districts, and in the writer's own district has proved very successful. These heavy cleats top and bottom keep the boxes from blowing up in the process of bracing a car and arrive in the eastern markets with a minimum breakage.

A committee of growers should be appointed to meet with a committee appointed by fruit shippers not only to standardize our various packages, but to insist that the mills furnish us with a much better grade of shook than we are now receiving, as its quality is very unsatisfactory at present.

Los Angeles Lugs. The Los Angeles lug is the latest innovation in the handling of green fruits for eastern shipment and has proven very satisfactory on the whole. Various sizes are now being made and as this package will be more extensively used each year, its size should be standardized. It can be most conveniently loaded if made the same length of the standard plum or grape crate, namely 17½ inches, the present average size of the lug being 5¾ by 14 by 17½ inches. We believe that if this package were made shallower, the bulk being thus reduced, it would prove more satisfactory to our needs. The size 4¾ by 13½ by 17½ inches is suggested.

In the making of these various packages it would seem advisable to use nails just a little larger than we have used heretofore; discontinue the use of 3-penny nails in the making of cherry boxes, peach boxes, and crates, and substitute the 4-penny nail. In any event, it is of importance to have your box-maker drive the nails flush with the wood and not sink them in, as this practice is the cause of almost as much damage or breakage as is the poor lumber you sometimes use.

Having considered the various packages for size and make-up, let us give some little attention to the pack. I am not competent to discuss the various methods of packing cherries as the game is unfamiliar to me, but I am more or less conversant with the pack of other fruits.

In peaches it is as important as it is in other packs to properly size the fruit to have the same degree of ripeness and to fill the box to capacity. You must understand that all fruit shrinks more or less in transit, in spite of the fact that it is under refrigeration, and a pack that leaves the coast loose arrives at the eastern destination in a very slack condition. It is also advisable to use a box shallow enough to necessitate the use of a cleat under the cover in nailing up, so that when the cover is removed at destination the under cleat comes with it. The shrinkage has been taken care of and the package looks full. Our present standardization law requires the fruit of practically the same degree of ripeness to be packed in the same container and this applies to all varieties and to all packages, and its reason is best appreciated when one sees the fruit on the eastern market. You all have often seen fruit leave our platform with some pieces highly colored and others in the same package of a greenish tinge. You must bear in mind that this difference in degree of ripeness does not change in transportation. That is to say, all the fruit ripens, but the ratio or degree of ripeness between the highly colored fruit and that of greenish tinge does not change, with the result that when the package is opened in Chicago or New York, our highly colored fruit is dead ripe and often moldy, whereas that of the rather greenish tinge is in the best possible condition. Hence the necessity of uniformity of color. We have dwelt upon this uniformity of color simply because it is one of the rules of our standardization law that receives the least attention from the average grower of today. We have seen fruit in this condition in most of the eastern markets visited and in a majority of the packs.

What has been said of the peach pack can also be applied to the crates, plums of all varieties, and in apricots. In the packing of crates, the most careful attention should be given to the lower tiers. These tiers should be tightly packed with fruit of practically the same size and of the same maturity. California must improve her crate pack, the glaring fault being today the little attention given the under tiers. We visit packing houses day after day in the fruit season and note that most of the packers roll the bottom tiers, tightening up the fruit by forcing in another cot or plum at random. Roll the second tiers in the same manner, and then use considerable care in packing a nice, smooth top. Such methods get by at this end, but in transportation the fruit shrinks, the bottom tiers roll, with the result that when the package is opened up in the East the contour of the top layer is as level as some of the orchards in Placer County.

In the packing of plums the packer should lay aside the jumbo size, pack the 5 by 5 and 4 by 5 sizes in crates, place the smaller fruit in a Los Angeles lug and throw the faulty and over-ripe fruit in the cull basket. The jumbos can then be packed in a 4-inch peach box, 96 to the box, and when a lug is full, the cover may be nailed on and the package is ready for shipment.

Little can be said regarding the packing of grapes, as the method is standardized all over the state. In the crate pack the stems are always hidden and the baskets must be packed exceedingly full, so that the surface appears to be a solid mass of grapes. Great care should be exercised in trimming all faulty grapes from the bunches, as a broken berry will invariably cause mold.

Pears are being packed correctly now. They should be of even size and maturity and always show a heavy bulge in the cover. We have seen pears of fine quality that were slack pack, without bulge in the cover, outsold by pears of inferior quality but of heavy pack and heavy bulge in the cover. Pears should always be wrapped.

Growers should strive to keep up their packs, and if possible improve them. The men that buy this fruit on the eastern markets are fruit men; they know their end of the game as well, if not better, than we know ours. They inspect all packages from top to bottom and the grower with a reputation for good pack and quality wins. The labor shortage of today has a tendency to weaken our pack, inasmuch as we are turning more and more to the piece work method, and we are firmly convinced that this method is a great mistake. The best packers today pay a day wage, insist that the pack come up to a certain standard, and that a packer to earn the wage must pack so many per day in a given number of hours and also must not exceed a certain number. This insures a good honest pack and eliminates the drones.

The Los Angeles lug is the next package to consider. The use of this package for eastern shipment is rather a departure from the old established custom of packing all our fruits and its use has been brought about by the labor conditions of the last few years. Certain growers found that they could not pack all their fruit with the available packers, so decided to bulk all plums, apricots, and other small fruits that pack 5 by 6 and smaller. This proved successful until the practice of bulking all varieties of fruit has been tried with more or less success. The lug is now being somewhat abused in some sections, or rather has been. Some growers, meeting with results beyond their anticipation, began to roll all their poor fruit into lugs, regardless of color, size, or any degree of ripeness. The standardization law has been amended so that lugs can now be inspected and these faults corrected.

In the eastern markets we found a great deal of diversified opinion as to the advisability of the lug pack, but buyers are now forced to buy both lug and crate packs as their customers demand that they do so. Some retailers like the lugs and others do not. The fact remains that there is a growing demand in all the large eastern centers for lug fruit and California will continue to supply the demand. Care should be taken in bulking this fruit, maintaining a high standard, otherwise the lug business can be overdone. It has also been proved that only certain varieties can be bulked in lugs with success. Plums and grapes are these varieties. Pears will not sell to advantage, peaches will not carry in such bulk; apricots should never be bulked, as the trade considers the apricot the most delicate fruit shipped from California, and they arrive in the eastern market in a wasty condition when forwarded in lugs. As suggested before, it is conceded that something should be done to improve the present lug; make it a little narrower and shallower probably and strengthen the package by placing a central partition in it. This partition would not only divide the bulk of the fruit but would prevent it from rolling from end to end of the package, as its appearance on arrival in the East now indicates. Buyers on the Eastern markets do not want this partition to appear in a lug pack of grapes but they do want the bottom strengthened. It has been suggested that a heavy cleat be placed across the bottom in the center of the box and that the same be nailed both to the sides and bottom, thus giving added strength but not showing as a partition would. This cleat would prevent the up and down movement in the bottom boards of a lug, which now loosens a great many berries from the stem. The present method of hiding the stem in the bulk of the pack has not proved satisfactory because in transportation the grapes are loosened from the stem by the movement of these hidden stems in the bulk and some of the grapes are punctured, which causes mold. It has further been suggested that grapes be placed in the lug in two layers, the bottom layer with the stems down and the top layer with the stems up. Thus grape rides on grape and the stem damage is practically nothing.

Keg Pack. The method of packing grapes in sawdust, known as the drum Emperor pack, is in its infancy. The eastern buyer investing from two to three thousand dollars per car for grapes packed in sawdust, is entitled to know that he is obtaining grapes of the very best size, color, and quality. The keg is a means of keeping a part of the grape crop from being forced on to the markets at the time of the glut and are held for two or three months until the crate and lug packs are all cleaned up. If the keg pack is to continue to prove successful in the

fruit business, growers will of necessity pack but the best quality of grapes in this package and the present standardization law should be so amended as to protect the grower and buyer.

In closing we wish to impress the fruit growers of California with the necessity of their constant striving for betterment. Improve the quality of your fruit; improve and standardize your packs and packages. The competition from other states should spur you on to a greater effort each year, and if we advance in the next few years as we have in the past few years, we will have but maintained our position in the great sisterhood of states.

The Chairman—As there is no further discussion, our next business is the report of the Committee on Resolutions, which will be presented by its chairman, Mr. G. R. Gorton, of San Diego.

Mr. Gorton—There are necessarily a number of resolutions which must come before this convention at this time. The first one expresses our appreciation for what has been done for us and it seems proper that it should come before the convention at this time, and, Mr. Chairman, if you will allow me, I will read these and suggest that they be acted upon one at a time.

The Chairman—While you are reading them I will ask that the house keep quiet.

(*Mr. Gorton then submitted the following resolutions. At the close of each resolution, he moved its adoption, and the motion was in each instance duly seconded and carried unanimously without discussion.*)

The resolutions were as follows:

REPORT OF COMMITTEE ON RESOLUTIONS.

WHEREAS, The Chamber of Commerce of the city of Chico, through its secretary, Mr. Frank B. Durkee, and the Chamber of Commerce of the city of Oroville, as well as the citizens of Chico, many of whom opened their homes to accommodate the members of this convention, the press of these cities, the trustees of the State Normal School of Chico, and Mr. C. M. Osenbaugh, principal thereof, have been unsparing in their efforts to entertain the Fifty-second Fruit Growers and Farmers Convention of the State of California; therefore, be it

Resolved, That this convention heartily appreciates the courtesy which has been extended to this convention, and that such appreciation be expressed by a rising vote of thanks.

WHEREAS, Colonel Marshall, formerly Chief of the U. S. Geological Survey in the State of California, has made a very careful study of irrigation problems in this state and has submitted a report thereon to Governor W. D. Stephens; and

WHEREAS, Said report offers plans and suggestions whereby the whole of the great valleys of California, together with a large portion of the surrounding foothills, can be brought under one great unified irrigation district, to the end that the flood waters may be controlled and an ample supply of water conserved to irrigate and bring into profitable use as a vast area of tillable land in this state; therefore be it

Resolved, By this Fifty-second Convention of Farmers and Fruit Growers of California, that we endorse the proposition of Colonel Marshall as being worthy of most serious consideration and study by the people of California; and we urge our state officials, and particularly the State Department of Engineering, to give this proposition a full and fair investigation.

WHEREAS, The most important industry of the human race, that of agriculture, is the paramount industry of our state; and

WHEREAS, California agriculture, in great measure does now and must forever depend upon irrigation for best results; and

WHEREAS, We view with alarm the effort on the part of great public service corporations at times to utilize for power purposes an increasing proportion of the waters of the state, to the great disadvantage of agriculture; therefore be it

Resolved, That in the direct interest of one million Californians dependent upon farming, and in the indirect interest of all, we insist that the right of agriculture to the use of water, whether stream-flow or stored, shall be recognized and confirmed as superior to the right to use water for power, and to this end we instruct the legislative committee to watch all developments in order that such rights of agriculture shall be protected.

WHEREAS, Infestations of weed seeds by distribution over the highways of California are becoming more serious every year owing to transportation from county to county of sheep, cattle and commodities; and

WHEREAS, Such weed infestations are not only a menace to the productive industries but disfigure the landscape; and

WHEREAS, The state law for weed control must be considered by the State Highway Commission, who may by force of example lead in upholding this law and thus make it easier for our county horticultural commissioners to enforce it on individual property; therefore be it

Resolved, That the Fruit Growers and Farmers of California assembled at Chico, do recommend the adoption of a method that will be uniformly enforced over the state and that a copy of this resolution be sent to the State Highway Commissioners for their consideration.

WHEREAS, Governor W. D. Stephens, through the Director of Agriculture and through a telegram, has expressed a keen interest in the welfare of the farmers and fruit growers of California, and has through his writings and public statements placed himself on record as favoring the utmost protection of our industry, the foundation of our wealth; therefore, be it

Resolved, That we express to Governor Stephens our appreciation of his stand and request his continued support of this, the most important industry of our state; and, furthermore, be it

Resolved, That we express our regrets that we were deprived of his presence at this convention.

WHEREAS, The fruit growers of California have been very greatly aided by Dr. C. P. Lounsbury, entomologist of the Union of South Africa, and his assistant, Mr. C. W. Mally, who have extended unusual assistance to the representative of the office of pest control, sent to South Africa by the Director of Agriculture for the purpose of collecting parasites of California insect pests; and

WHEREAS, Through Dr. Lounsbury's activities the government of South Africa has provided our collector with a laboratory and furnished him with railway transportation free of charge, courtesies which have not heretofore been extended to visiting scientists; and

WHEREAS, These gentlemen have in the past taken a keen interest in our pest control problems, giving generously of their own time for the purpose of collecting and shipping beneficial insects to the State Insectary for the benefit of the fruit growers of this state; therefore, be it

Resolved, That the Fruit Growers of California, in annual convention assembled, extend a sincere vote of thanks to Messrs. Lounsbury and Mally, and to the Minister of Agriculture of the Union of South Africa, for the unusual and very great interest which they have taken in our welfare.

WHEREAS, This convention keenly appreciates the purpose of the Associated Nurserymen of California to organize and prosecute a campaign for securing stocks of fruit trees from carefully selected buds from trees of high quality and for more completely eliminating all causes for complaint because of errors in naming or labeling nursery stock; and

WHEREAS, Recognizing as we do that losses suffered by nurserymen from overproduction of nursery stock must at last be paid by fruit growers in increased cost of trees; therefore, be it

Resolved, That we pledge ourselves so far as we are able, through our various organizations, to make available to the nurserymen the knowledge of our needs for trees, as far as possible, in advance of planting, in order that the immense waste prevailing in previous years may be avoided.

WHEREAS, This convention recognizes that the present salaries of the horticultural commissioners and of horticultural inspectors are wholly insufficient to maintain efficient officers in these important positions; therefore, be it

Resolved, That the legislative committee be instructed to endeavor to secure a reasonable increase of such salaries at the earliest possible date, since the work in each of these lines is suffering very seriously from such inadequate compensation.

WHEREAS, With the enormous growth of California's horticulture the problems of utilizing increasing portions of the output for by-products, jams, jellies, sirups, candies and for dehydrating and canning, are of enormous importance, and one problem alone, that of new uses for the ex-wine grape, involves either the salvage, or the loss, of twelve millions of dollars a year;

Resolved, That the legislation committee of the co-operative and other producers of California be requested by this convention to consider the necessity of the University of California establishing, on an adequate scale, a fruit by-products laboratory and experimental demonstration plant.

We suggest that the committee, at a suitable time, take the matter up with Dr. Whitten, Dean Hunt and the Board of Regents of the University.

WHEREAS, The Bureau of Plant Industry, U. S. Department of Agriculture, has for many years maintained a number of experimental vineyards in different sections of California and has thus promoted the culture of wine, table and raisin grape varieties within our state; and

WHEREAS, We believe these experimental plats under the direction of the pomologist in charge of viticultural investigations, U. S. Department of Agriculture, can be made to perform a service of great value at this time through experiments calculated to determine the feasibility and practicability of converting our wine grape vineyards aggregating 175,000 acres and an average production of 400,000 tons into the growing of table, raisin and currant varieties or of using their present crops for purposes other than wine making; now, therefore, be it

Resolved, That the Fifty-second Fruit Growers' and Farmers' Convention earnestly requests of the congress of the United States that adequate appropriations be made and authority be given for the fullest use of these experimental vineyards for this purpose; and be it further

Resolved, That we particularly request the purchase of two of the most important of these experimental plats, viz, the one situated at Fresno, California, and the one at Oakville, Napa County, California, both of which are located in the heart of important grape producing areas, and we understand the leases covering these plats will soon expire. Work of a most important nature is already under way with the end in view of aiding our grape growers in the manner indicated, and this will be entirely lost unless these properties are purchased outright and properly equipped for the prosecution of this work under the most favorable and effective conditions; and be it further

Resolved, That copies of this resolution be sent to the representatives of California in the Senate and House of Representatives and to the Secretary of Agriculture.

WHEREAS, The prices of the necessities of life have risen to dangerous levels, constituting a menace to the consuming masses of our people; and

WHEREAS, There is only one way in which we can restore prices to normal, namely, by greater production of necessities, by decreasing demands for luxuries, and by personal thrift; and

WHEREAS, The government of the United States has wisely carried over into peace-time from the period of war its campaign for thrift and the sale of government securities such as Thrift and War Savings stamps, and Treasury savings certificates; and

of the right kind of people so that we may assimilate the people who come here, land owners, and workers who will help to build up this glorious state of ours along permanent and enduring lines.

But we can not hope to get more people of the right sort and more money unless we let the world know what we have here in California. We must let the world know of our natural resources; what we plan to do and what we can do on the Pacific slope. We must tell them, not only of our climate and soil, our mountains and valleys, our forests and minerals, our rivers and tidewater, but also of the great farm bureau system, our land settlement projects and the reorganized Department of Agriculture, as well as about the wonderfully successful co-operative associations which the fruit growers and farmers have built up for themselves. (*Applause.*)

So I think I will give you a few figures from our 1918 budget which will point the way.

Last year, 1918, the lumber business in California amounted in round numbers to thirty-eight million dollars. The mineral output was seventy-two million dollars. The petroleum output was one hundred twenty-seven million dollars. These are my figures. The figures of Mr. Hecke show the agricultural products were six hundred forty-five million dollars in one year.

So it seems to me that points the way, clearly and logically, how we should proceed. Agriculture is a basic industry of all industries to us in California. It is by long odds the greatest asset of this state. Of course, the more we encourage shipyards and factories and mills and all that sort of thing the more we build them up, the more we build up this state and add to its prestige and glory. But adding to its agriculture—and agriculture means industry—the more we are adding to, fostering and encouraging the building up of the state in every possible way.

But we must tell the world what our possibilities are in the way of agriculture, minerals, mountains, falls, and tidewater. We should tell the world what the state government has done for the industry of agriculture, for the fruit farmers and horticulturists to advance the interests of agriculture in the State of California.

I would like briefly to refer to a few of the things that the state government has done. One is the creation of the State Department of Agriculture of which Mr. Hecke is the head. Mr. Hecke was Horticultural Commissioner of the State of California, and the very best one we ever had, in my judgment. (*Applause.*) Also, he is a very successful farmer in Yolo County.

This Department of Agriculture, I would like to add, incidentally, is the only thing which survived the wreck following the report of the Efficiency and Economy Committee appointed by the Governor to report to the legislature in 1919 as to how the state government should be reorganized so as to get greater efficiency and more economy.

The purpose of the report was to divide the state government into natural functional organizations: those things which uphold the financial department; those things which build the educational vocational departments; those things that build on agriculture.

But that report was only partial, and while the plan was only partial that was submitted, our opponents were too many for us, and the Department of Agriculture was the only department which survived.

But while this was necessarily partial, the legislature made certain changes which ensued and abolished certain statutory positions and said that everything that belonged to the agricultural interests should go into a new department with Mr. Hecke as director, who should have power to name such assistants as he needed.

But the legislature when it abolished statutory positions also abolished statutory salaries, so Mr. Hecke is facing a very grave loss of revenue and a very grave need of money, and he will not be able to do during these coming two years what he would do had he sufficient funds. But, even insufficient as the funds are, I predict he will make a wonderful showing indeed for the new Department of Agriculture. (*Applause.*)

Another thing this State of California has done has been the land settlement project at Durham, of which my good friend here, Dr. Mead, is the head.

I think the criticism made of that project is that there are only California families there, with but one or two exceptions. That is probably true. The project is new to America. We had to demonstrate here in California among ourselves that it would succeed before we could bring in people from other states and other countries. But it has been a great, big success. Eleven other states, I am told, have sent representatives and agents down there, examining that property and that community, and are preparing to start like enterprises in their states; and the governments of Japan, Canada and Australia have had their agents there, and also New Zealand, to visit the project and see what Dr. Mead had accomplished there.

So great, indeed, was the success of this project that the last legislature appropriated a million dollars to like projects to be established in other parts of the state.

Very recently Dr. Mead got estimates on eight thousand acres of land in Tulare County. I think I can add, incidentally, without betraying any confidence, that this eight thousand acre tract in the Turlock district has been secured by Dr. Mead and his associates who have acquired it from the owners of the land. That is merely a passing reference.

Another very great instrumentality that the government of California has instituted to advance agriculture is the farm bureau. Since 1914 these bureaus, numbering eighty-five, of the farmers of the state—something like twenty-five thousand farmers—have been organized into a State Farm Bureau Association. It has been described as the greatest organization of farmers ever known in any country since civilization began. These farmers get together for mutually co-operative benefit and get in touch with the agencies of the government which deal with agricultural matters. The farm bureau is merely like the chamber of commerce, or the board of trade—a clearing house where farmers get together and discuss their problems and tell their experiences and are instructed by such men as Dr. Hunt, of the University, and other very able assistants. They have the aid of various associations, the deciduous and citrus fruit associations, the live stock associations and other agencies that the farmers have established for themselves.

So I think, here in this state of ours, no farmer from the East, from Kentucky, Ohio, Indiana, Nebraska or New England or any other place, need fear to come, to know our climate and our soil conditions and other vital considerations, because they will be explained to him through the

state, county and other associations which are able to take care of him and put him on the right road.

The crop figures for the past year for agricultural crops are worthy of our consideration. For fruit and grapes there was received $171,626,000; for field and truck crops, $351,400,000; marketable farm animals, $67,696,955; dairy products, $54,428,056; making a grand total of $645,151,011.

These figures are almost incomprehensible; we have hardly been able to grasp the resources of the State of California. There seems to be no limit to what we can do with our crops and apparently no limit with our supply. Seven years ago rice, for instance, was not grown in any commercial quantity in the Sacramento Valley, and yet this year the rice crop amounted to $23,000,000. That is, $23,000,000 from nothing. Seven years ago, nothing; today, $23,000,000. Now rice is grown in the Sacramento Valley in competition with the South, around the Gulf, and in competition with the rice of Japan. In a few years we may become the leading rice growers of the world, if we keep on this way. So it is with other crops. In Yolo County we have a thousand acres of tobacco which represents a profitable crop for the future and will become one of the great industries in the near future right here in the county of Butte. Then we have the Wyandotte silk industry. Recently three hundred thousand mulberry trees were set out, which makes that industry an assured success, and one of the most attractive in the State of California. We have heard tonight about the date industry, and so we can cite and observe the growth of many new industries in this state.

I noticed recently that there are remarkable contrasts in the assessments in Orland, in Glenn County. The federal government's figures state that ten years ago the orchard assessments in Glenn County were only $25,000; now they are $2,245,000. Ten years ago stock there was assessed at $60,000, and today, $640,000. Ten years ago land in that district was assessed at $245,000 and today at $3,700,000. That will show you what comes about when water and land are brought together, under intelligent supervision.

So you can go on down through Turlock and the entire San Joaquin Valley, Oakdale and Modesto—you see the same thing where, several years ago, there were great fields, now there are business houses and thriving cities and the land outside the cities is being cultivated by thousands of prosperous farmers.

Let me go further. Down in the Imperial Valley a few years ago there were thousands of acres of barren waste; today it is one of the most attractive spots in the State of California. Ten years ago the population there was fourteen thousand; today it is fifty thousand. The assessed valuation there ten years ago was $14,000,000 and today it is $715,000,000. Ten years ago the cotton crop there was 6000 acres; today it is over 60,000 acres and the assessed valuation of its products last year was $50,000,000 as compared with $5,000,000 ten years ago.

That shows what we can do along the lines of the development of new products in sections of the country which heretofore have not been used.

California as a whole has 158,000 square miles. Georgia has 58,000, New England has 66,000, the middle Atlantic states 102,000. Here we have 158,000—99,000,000 acres of agricultural land, of which 29,000,000 are improved, one of the main industries being fruit, and 960,000 acres of school and public lands.

The assessed acreage in this state last year exceeded 48,000,000; the assessed value was $1,000,970,000 and the actual value was four and one-half billions.

In such a vast state these products of the land fall into the hands of private owners, but we know that there are still vast tracts not put to full productivity; some very little, perhaps, and some not at all. That is a condition which we must all deplore. Various suggestions have been made to overcome this and to take up some of the slackage. Unearned increments and taxation matters, and suggestions of various kinds have been advanced, but in my judgment we can not meet that problem until we have more people here and more money and more small farms developed here in California. (*Applause.*)

In the early days land was cheap, tools were cheap and farm labor cheap, so the natural development was through extensive farms. Today land is high, labor out of sight, and the cost of implements almost so. The tendency, therefore, now is toward intensive farming and the natural conditions are toward the breaking up of those vast tracts which have existed in the past and making them ready for use so that we can help people go upon them and develop them in smaller tracts.

During the last session of the legislature a bill calling for three million dollars was appropriated for the development of the Sutter Basin, to be paid for at the rate of $300,000 a year during a period of ten years.

But let me say this in conclusion: We must work together. Whether you are from San Diego, Los Angeles, Oakland, San Francisco, Stockton, Chico, Marysville or Colusa, stand for your own town, yes—but stand for the other fellow, also, and all stand together for one great, big and glorious California. (*Applause.*)

The Chairman—Mr. Herbert A. Easton, of London, England, is here in our city at the present time, and I would like to introduce him to this audience. He is studying the land colonization plan for the London "Times." I wonder if Mr. Easton would favor us with a few remarks at this time. (*Applause.*)

Address of Mr. Herbert A. Easton.

MR. CHAIRMAN, LADIES AND GENTLEMEN: I would like to correct a statement made by the toastmaster that I am here officially representing the London "Times," because that is not correct. What I promised to do is to let the editor of the London "Times" have my impressions of the land colony which I am to be shown tomorrow by my friend Dr. Elwood Mead.

Briefly, my mission here is to let the people of London, England, through the "Times," know what California is doing in the way of settling the people on the land. I am also going to give Mr. Hughes, the Prime Minister of Australia, where I live, a copy of the report that I am sending to London, England, of my visit here, because the ravages of the war in Europe have been such during the past three years that unless we can get the people away from the crowded cities we feel that the social policy may explode. We feel that the land is the safety valve of the boiler, and if we do not use the safety valve at the appropriate time an explosion is inevitable. That is the recognized feeling of some of the greatest statesmen of Europe today, who have at considerable length investigated the causes of the revolution in Russia. Sir Paul

Vingrydorff, one of the greatest authorities of Russian agricultural aims, told me that in order to trace that revolution we must go back fifty years to the men who have been holding up the land against the masses of the people. He said if the people in Russia had been treated like the people in France, with something like six or seven million small peasant proprietors, with some one to lead them, they would break into a revolution.

Revolutions are caused in the main by large masses of people being oppressed, and any country in the world whose people have no stock in it can have nothing to lose by a revolution. If America can show the world how to rectify this by its example it will benefit all the peoples of the world and the fruits of our victory will not then be in vain. But, believe me, if not, all the horrors we have been through will be in vain. If we are not going to use God's land for the purpose for which He created it, to produce as much as it can, then I believe half the fruits of our victory will be wasted.

I do not propose to weary you at any length, but I do thank you for the opportunity you have given a stranger in your midst to say a few words on this subject, and, believe me, I am going to take in very carefully what I see tomorrow, and I believe I am not going to be disappointed. Gentlemen, I thank you. (*Applause.*)

The Chairman—The next paper is entitled "Reconstruction," by Mr. Charles Bentley, of San Francisco.

(*Mr. Bentley then read the following paper*):

RECONSTRUCTION.

By CHARLES BENTLEY, San Francisco.

It may be interesting to recall that, in the period immediately following the conflagration of San Francisco in 1906, there was a period of great industrial activity with high wages and extravagant living. This was followed in about a year by a series of years representing a very much depressed position of trade and activity. This situation may serve to illustrate what we must expect following the present period of expansion after the great World War, for the law of equal and opposite reaction applies to economic and human relations as it applies to mechanics and abnormal depression must follow abnormal activity.

It is fitting that in time of peace we prepare for war, and equally fitting that those interested in commercial and industrial welfare take counsel together at this time in order that they may anticipate, as far as possible, the evil days to come, thereby reducing the distress which will certainly accompany them.

Owing to the general world shortage in foods and food products, we fruit growers have been fortunate in finding profitable markets during recent years, and it is important to remember that, whether one is interested directly in export trade or not, it is perfectly obvious that the prices which have prevailed this year could not possibly have been obtained were it not for the heavy demand from foreign countries for various lines of dried fruits and canned foods. It will be of first importance, therefore, for us to consider whether such demand is likely to continue and whether the goods now passing into the hands of wholesalers and importers will ultimately go into consumption on the basis of the present price levels. Unfortunately, there has been considerable speculation and reselling within the trade which has the effect of pyramiding the cost and unnecessarily increasing the cost to the consumer. This has come about in spite of very definite efforts made by producers and packers in California and the inability of some of these speculators to market their goods promptly has led to some slight reaction, but it is safe to say that the bulk of the crops have been sold at prices which should warrant us in expecting that the goods will go into consumption in time to insure good markets for next year—always provided that the large foreign markets are not closed by embargoes, high import duties, or other trade restrictions and always

provided that these markets are in a position to establish credit in this country and buy their goods without sacrificing all of their anticipated profits in the falling rates of exchange. In the meantime, it is a matter of utmost importance that all producers and packers of California fruits do their utmost to see that their products go into consumption, for, otherwise, we shall feel the reaction when it comes to selling the crop of next year. It is for this reason that important factors in the state have thought it necessary to continue national advertising at great expense, in spite of the fact that they had been unable to supply the demand of their wholesale buyers so far as the past two years are concerned. It may fairly be stated that any association or organization carrying on such a campaign is rendering a public service to the fruit industry of California.

It has been my privilege to serve in Washington during the larger part of the war and more recently to attend certain conferences having under consideration matters of international trade. As I have been asked to address you on the subject of reconstruction, it seems fitting to give you some of the conclusions formed after attending conferences with various departments of our own government as well as with delegations of merchants from abroad. In the International Trade Conference recently held at Atlantic City, it very soon developed that it was really a question of the ability of the belligerents and nearly bankrupt nations to finance their buying in this country, always assuming that their respective governments would permit the continued importation of such products as those which interest us. We are selling these nations so much more than we are buying from them that there is a tremendous balance of trade in our favor, the pound sterling having dropped from par figures of $4.86 to $4.10 within the past few days. You can realize that this means that the English buyer of prunes at 15 cents in this country has really to pay over 17 cents in order to make the payment of 15 cents in American money. Naturally, England will not permit the export of gold to equalize the exchange, as this would shatter their reserve and their national credit. Conditions are much worse in Germany, Belgium, France and Italy, and it should be remembered incidentally that Germany was a most important market for our dried fruits before the war. Indeed, much of the heavy buying this year done in the neutral countries was done in anticipation of German business. There is a danger that these governments may restrict the importation of less essential things in order to help the exchange situation and thereby lower the cost on what they may regard as the more necessary staples. Great Britain, for example, in order to prevent extravagance and profiteering has placed maximum selling prices above which articles like dried prunes must not be sold. It is difficult to anticipate how far this policy may be carried. If, for example, the British government should determine that prunes must be retailed in England for 10 cents per pound it would practically mean a prohibition of business for next year. It is possible, too, that foreign governments may feel the necessity for increasing their import duties in order to raise revenues and this would tend to restrict importations. It is obvious that these foreign nations can not continue buying unless they can establish credit in this country by selling us some of their products. In order to maintain anything like the present activity in agriculture, or in industry, we must assist these foreign countries to produce—not merely to establish commercial credit, but for their very salvation as peoples and nations. So we must use our influence to see that legislation calculated to restrict importations through tariffs or embargoes should be carefully scrutinized and determined—not merely on those principles which have ordinarily governed such actions but in the light of international obligation which can not be avoided. In our effort to extend foreign markets for our wares, we shall be in a weak position if we ask for a protective tariff on some of our own products at home. It would be unfortunate, in my opinion, if we were endeavoring to secure a high import restriction against dried prunes at the very time when we are seeking a reduction in the tariffs of many foreign countries from which our prunes and dried fruits are restricted by reason of high import duties. We do not need any protective tariff on prunes or dried apricots or dried peaches. We can export them to all important countries which do not maintain high import duties against them, but we do need a foreign policy in our government. We do need a bargaining feature in our tariff laws so that when we take off the import duties in the Latin-American countries (as we have done), admitting all of their products free of duty, we shall be in a position to require that they take their high duties off the products which we wish to ship to them. With the enormous increase in our acreage of fruits and the inevitable reaction

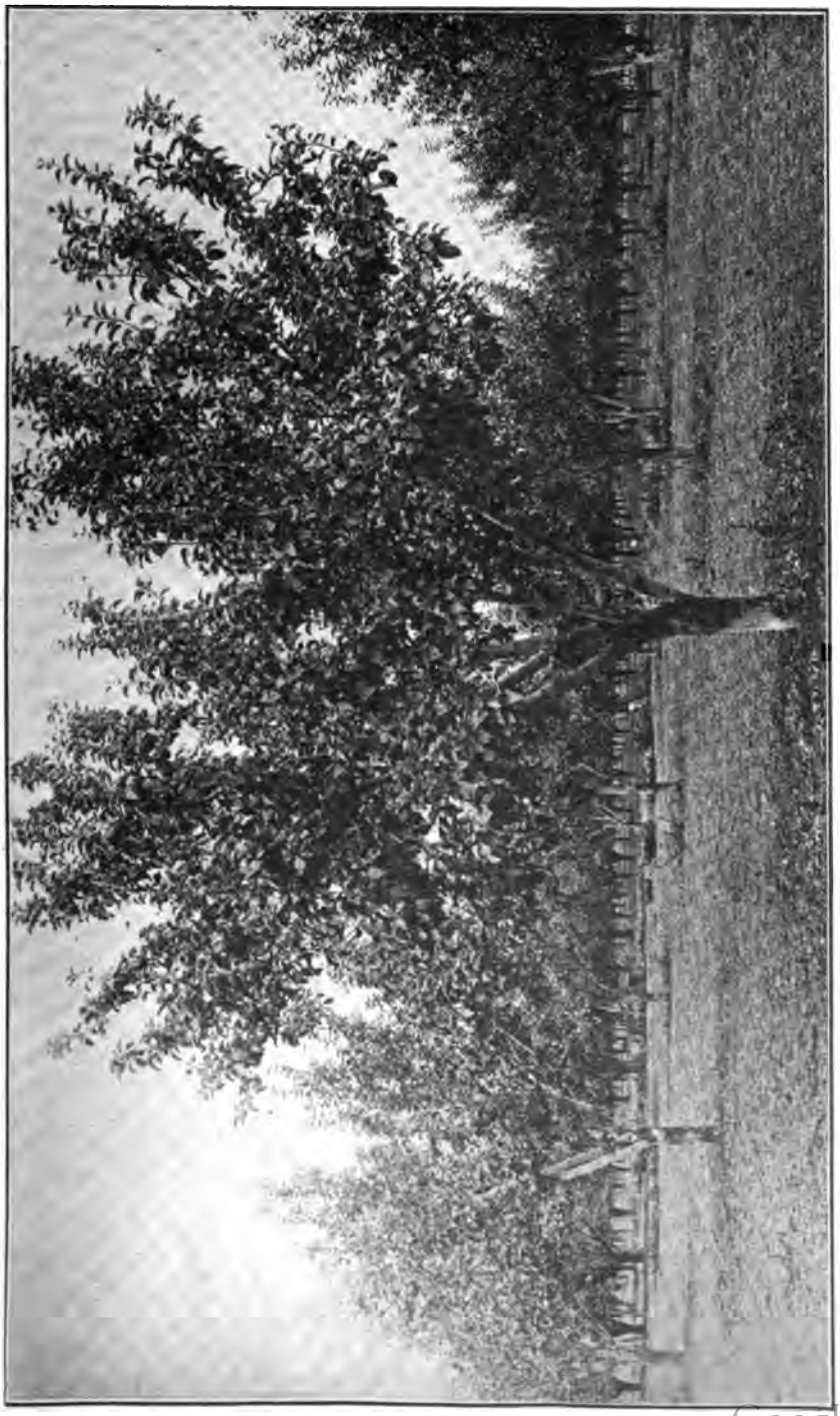
which must follow this period of extraordinary expansion, it will be worth our while to see that our representatives in Congress are kept informed as to the pressing need of opening up the markets of many countries now closed to us by hostile tariffs.

Foreign loans are being floated in this country at the present time and it is likely that we shall see more of this in the near future. In fact, at the recent International Trade Conference, it was recommended that such loans be taken up in a popular way, much like our late Liberty loan, for it is estimated that—in order to maintain anything like our present industrial activity with the present strong market for our products—$2,000,000,000 in credits will be required. Now, we must not lose sight of the fact that while these credits will enable us to keep up temporarily at least our heavy export business and probably assist in maintaining the present high level of prices, such action will only postpone the inevitable period of reaction and the situation can not permanently clear itself until these foreign nations are actually producing and selling profitably so that they may establish real credits and not credits which must necessarily lead to further inflations.

Another phase of reconstruction has found interesting expression in the Industrial Conference. As Secretary Lane has said, "It died at its birth because questions arose which it was not prepared to meet then." The underlying practical difficulty was really the question of the open or the closed shop. In the meantime, employers are coming to see that labor is entitled to more than a living wage and if we are to escape disaster, labor must realize that unless there is profit in industry there will be nothing to divide. Collective bargaining, trade unionism, boards of conciliation do what they will—labor can not enjoy the fruits of industry unless industry be productive.

As to the League of Nations—I count it one of the greatest privileges of my life to have been associated with Mr. Herbert Hoover in Washington during the war. From his peculiar experiences in foreign lands, his extraordinary ability and character, his splendid and unselfish patriotism, I feel justified in saying that there is no one better able to interpret the social and economic conditions now prevailing both at home and abroad. He says: "We are dependent upon Europe for marketing the surplus products of our farmers and laborers. Without order in Europe, we will at best have business depression, unemployment and all their train of troubles. With renewed disorganization in Europe, social diseases and anarchy thrive and we are infected by every social wind that blows from Europe. We are forced to interest ourselves in the welfare of the world if we are to thrive. No American who has spent the last ten months in Europe does not pray that we should get out of the entanglement and the sordid selfishness, the passions, the misery of the world. Our expansion overseas has entangled us for good or ill, and I stand for an honest attempt to join with Europe's better spirit to prevent these entanglements from involving us in war. We are not dealing with perfection—we are dealing with the lesser of evils." The treaty of peace should be ratified with some reservations, but no reservations which threaten its life. The delay in getting the peace treaty into operation is preventing the stabilization of European government and trade. It is preventing laboring classes from getting to work. It is aiding radicalism and bolshevism everywhere and, if prolonged, will depress all lines of American business and agriculture.

Perhaps the most encouraging feature of our present social conditions is the organization of returning soldiers into the American Legion. The spirit of high-mindedness and patriotism devoted to unselfish national service is perhaps the best antidote for those subtle poisons which are being injected into our body politic. This organization is nobly conceived and is entitled to the confidence and support of all thinking citizens of our country. The Legion has caught something of the spirit of that great national leader who has recently passed on and the anniversary of whose birth we recently celebrated. It was Roosevelt who for twenty years was preaching and practicing the doctrine of the square deal. He it was who awoke the conscience of our people, and were it not for his teaching of these twenty years we would likely be in the flame of revolution in our own country today. So it behooves us, as we would guard our comfort and the safety of our children, that in this period of reconstruction we shall look first to the constitution as the sacred ark of the covenant, always remembering that without law and order we go back to barbarism, always remembering, too, the spirit of Roosevelt, the spirit of service, the spirit of the square deal.



A California Apple Orchard. Variety, "Yellow Newtown." This variety furnishes the heaviest commercial production.

we shall see that they have come to us from a weakness due to the disintegration of our agricultural population, and this is an effort on a large scale to re-establish small homes and agricultural industries and we know that any aid we give to that is of benefit to human welfare.

And so we are meeting today in a sense of security and with confidence that the industry to which we are contributing is eternal and everlasting.

I wish, however, there were just a few more of the people here who have settled on this colony that I might give them just a few words of strength and encouragement. We all live in California, but, like everybody else, the things that are closest to us we see most indefinitely and most dimly. We can note the things that are far off; the majesty, the magnitude of the things that are at our very feet are the things that it is hardest to open our eyes to. So, living in California, I don't believe we can see California as history will see it and as persons in other countries see it.

I heard a speaker at the banquet last night say we must tell the world of what we have here that we may get settlers and developments here. I think the stories of California already contain a world's vision. The soldiers who were in France told me that wherever they went and said they were from California there was a look of gladness in the eyes of those who heard them and a great desire to know the stories of the land that is already fabled as a wonderful land. I don't believe there will be standing room in California after the next ten years. I want to tell these men who have been fortunate enough to secure a lodgment here that they are fortunate to be one of the proud possessors of the holdings which they have. I would have liked to have looked into their patient eyes and faces and see there the rare quality of humanity, to see the influences of the somewhat hard life they are passing through and the evidences of fortitude, of faith and of courage and to know that their faintest hopes will be realized.

I have been privileged to look over California and see it undergo many changes and great development. I have seen great colonies located on what had formerly been cow pasture or a sheep ranch. I have seen the people build their little homes, plant their beautiful little flower gardens; I have seen them put up their temporary schoolhouse and then I have seen them go on overcoming the difficulties of the soil and plant their oranges and other trees. It looked like a pathetic thing, almost, and as if they were following a forlorn hope, and I was just wondering how they were going to succeed in their venture. But time showed them that that alchemy of the California soil and climate seconded their efforts, and those who stuck to their venture and persevered in due time found the fruition of all their hopes and the fulfilment of all their desires.

If these people will buy a few sheep, plant some trees, continue with reasonable industry and with reasonable persistency and confidence, in a short time they will be able to build a new schoolhouse and the little sheds in which they started their homes will grow to greater dimensions and into more comfort, and all the rich traditions associated with the molding of nations and of complete and stable society will come to be realized and to dwell amongst them and to bless them and us.

I wish they were here today that I might say these things to them face to face. I do wish to congratulate them upon their spirit and the

ambitions which animate them in following the pursuits of the soil in toil and hardship in which they are privileged to consecrate their lives to so great and constructive a service.

I did not intend to say these things; they just came to me born of the rich suggestions and the beautiful amenities with which we are surrounded. Speeches are to be made by those more capable of making than I am. I believe the first one you will hear at this time will be by Dr. Elwood Mead, Chairman of the State Land Settlement Board. Dr. Mead is a man who is devoted to the wants of the nation and whose useful life has found here, probably, its best expression. He is teaching us in California, lessons tending toward the strengthening of our own state. He has started an enterprise here which other lands will imitate and adopt because the enterprise has to do with the soil itself, and its utilization, which is the very corner stone of Anglo-Saxon civilization.

Dr. Mead, I wish you would tell us, not what you have done, because you can not do it, but tell us a little something about it. (*Applause.*)

THE DURHAM COLONY.

By Dr. Elwood Mead, Berkeley, California.

It is a great pleasure on behalf of the settlers of the Durham Colony and the owners of this grove to welcome you here.

This grove that you see has been set aside and dedicated for community purposes. It is not the gift of anybody; it is the gift of these settlers. They pay for this land. In the very beginning, in their hard struggle to pay for their own particular homes, they have undertaken to pay for this grove and make it something that the whole state is ready to occupy and enjoy. And these settlers have built in the first year of their struggle here, this platform as a place for social meeting and enjoyment. They have made use of it, and not only they have made use of it, but you are making use of it, and a dozen different gatherings representing the county and the state have come here to make use of it.

Now, that shows that we are building up here a new community life, a community feeling which you have got to have if you are going to make rural life attractive, if you are going to compete with the influences of the city.

Two years ago the name of "Durham" meant a crossroads. This land that you are going to look at today was owned by two persons. No owners had lived on it for twenty years; no one connected with it was interested in a direct way, or in the upbuilding of rural society or rural service. It was farmed by hired men and tenants. Today there are over one hundred comfortable homes occupied by people who are making a struggle to pay for them; making this their permanent home; making it a place to be lived on by their children and their children's children. So that there is a feeling of permanence here that you want to put in every community and it is a thing that seems inculcate in our rural life, and this is the feeling that has been inculcated here because of the way this colony has been planned and organized. The people get better homes, they get better stock, they are working with better tools, and the land has been more productive this first year than would have been possible anywhere without this implanted development.

Now, this colony of Durham is not interesting because of what has been done in a material way alone, but because, also, it is an illustration of what democracy can do when it seeks to promote general welfare. We are endeavoring here by simple, helpful, and practical means to enable the people who have little of money or assets to become home-owners. That is the thing that lies right in the foundation of our strength and influence as a nation. We must keep in the minds and hearts of the people courage, confidence and ambition, and aspiration to become home-owners. That is the thing that made this country great during the first century—free land, or very cheap land encourages home-owners and the land becomes a land of home-owning people. It has made it possible for the young man who aspires to be a home-owner to become the owner of a home, to get

right on the soil, to be a part of the environment where he lives; but with the disappearance of free land, with the rising price of land, this nation entered on a new social and economic era. The struggle to become home-owners became more severe; the percentage of failures became tragically large. We are in danger of drifting into tenancy; large parts of the country are drifting into the dangerous tendency towards tenancy unrest. That was true in California as it is in some other sections.

Now, this is a movement to supply free land; to put into the hands of those who desire it those things that will make it safe to become a home-owner or to make home-owning less severe; that will make results more certain.

I would like to take a little time this morning to explain to you just in homely details some of the things that have been done here and some of the things that this law of California intended to bring into operation. The whole desire of this law is that those who are entrusted with its management shall be able to supply the needs of the man with little means who wishes to try to become a farmer, and they will put within his hands those things he needs as fast as they can safely and wisely do to help him get good results with less effort, and with less waste of money and time.

Now, let us see what we have here. We have over one hundred families. As I say, they have come in here and the first thing they had to get was a house and a barn, and then they must get their fields planted. If you allow these one hundred people to come here and bring their families with them and require them to do all this development work alone, almost unaided, you will have one hundred families leaving their farms and going away to hunt cultivators, going away to buy lumber, hardware, etc., going away to get plumbers and doing a hundred things which are needed in the first place to get a habitation. And because they are unacquainted with local conditions and tradesmen are unacquainted with them, and because they must act quickly, they act at a disadvantage and you will have houses that will be poorly planned, unpleasant to live in, uncomfortable, and worse. But if you have these men working without the stress and strain of realizing that their money is being wasted, although they are doing the thing they ought to do the very first thing—if they are doing the things that will bring in an income they will be encouraged right from the start. So, one of the first things was the employment of a farmstead engineer; a man thoroughly trained for the particular position and full of human enthusiasm and of sympathy for those people, who would meet with them, confer and plan their houses and then superintend the erection. And that could be done because we could buy it wholesale; because the people who sold the goods to us knew that they were selling to cash customers and knew that those people had our backing behind them and they could deal with them and with us with entire confidence.

In that way we can buy in a community manner, and then the community can start in with but little capital and the community can have their own houses built as quickly and as comfortably and attractively as is possible for but little money.

That is just an illustration of how, if you start wisely, you can get results. And it is an illustration that good taste costs no more than poor taste.

Now, another thing. This is mainly mixed farming in this colony. The university is helping out. The University of California and the College of Agriculture determine that these lands can be used for certain things to the best advantage. And it has been determined that the best advantage for this colony is mixed farming, that is, live stock, with a large element of the dairy cow is a great factor here. Before we started in here we wrote to fifteen agricultural colleges and we said to them: "We are going to have one breed of dairy cows and we shall have nothing but pure bred sires, and it is going to be very attractive to them because they will not be looking for form and color as well as other points outside of the pure bred stock and it will be a stimulus to better farming." And we told them we would like to know what they thought of the idea and we would like to know what breed to recommend. Without a single exception they replied that it did not make any difference what breed we took but that the idea of having but one breed and having pure bred sires, and striving for excellence of quality was a good one and it is going to be for the betterment of the community as a whole. We were to have six steers. They told us which breed they would prefer, individually, and the one they thought would be best here. Then we turned those letters over to the people in the colony and told them to read them and see what they thought of the idea. We had prepared a constitution and by-laws for a co-operative stock breeders' association and we found there was no difference of opinion and they

all became members of the association. They selected the Holstein as the breed of cattle and the Duroc as the breed of hogs and then they started in to see what could be done with them.

Now, if you had let these people come here without any organization, let them plan out how to get along as best they could, you would have one hundred farmers here going out buying cattle and whenever they went to a sale they would be bidding against each other, cutting their own throats, and there would be one hundred people living there on farms to go through that performance, but here they were organized from the start as a co-operative association and they picked out the best judges of stock and the best price and said: "You go and buy for us."

Now, that is another thing for your community life that you have to do. When you come to deal with the people of the city you deal with specialists and past masters in a particular business. But in a farm community it is the average mind that guides the community and has to compete with the best minds of the city. That is what you are doing here in these co-operative associations.

Well, they turned out their better stock here in Durham, and this is the only community in California, that I know of, in which the whole community is tubercular free. If there are any tubercular animals, they are cut out.

Now, realize for a moment what that is going to be worth to this community ten years from now. Few of us can adequately estimate what a community suffers from the loss from tubercular cattle; and what they lose from being unable to maintain a standard. I want to give just one illustration of that thing to show how the co-operative association is helping this community in this respect.

Recently there was a sale of one of the great Holstein herds in this country. Good Holstein herds are scarce but this herd was among the good ones in this state. Our buyers said to them: "We don't buy up cattle. We will let you know what we are doing. We are acting as trustees for our neighbors. We should like to examine that herd; we would like to know what the individual quality of the cows is. We would like to test them for tubercular trouble."

There was a little reluctance about that but it was evident that this was the best buyer who was going to be there and that one hundred farmers were going to be represented in that buying. The cows were tested and it was found that the cows in the herd were practically free from tuberculosis. That was one point in its favor and in favor of the individual quality of the cows they were bidding on. The buyer went through the lot and bid them in and brought them here.

Now, we had one hundred farmers here who wanted cows. Perhaps, not all of them wanted them, but a large number wanted cows and there was a good deal of strife among them to get the best of those in the herd. There was a question as to how it should be done and the way they did it was this: The cows were put up at the price which had been paid for them and anybody who wanted to pay that price got the cow if nobody else bid any more for it. If anybody there wanted to bid more for it he could do so and the one who bid the highest price got it. When the sale was through it was found that they had gotten $500 more than they had paid for that herd. One of the cows sold for $150 more than they paid for it; some of them did not sell for as much. Those cows which did not get the purchase price were put up for whatever they would bring. The net result was that the live stock breeders association had $500 more than the buyer had paid for the cows. Everybody was satisfied; everybody got what he wanted. If he didn't, it was his own fault; he had the chance.

Now, that $500 is a part of the fund of the association and Durham today is the home of some of the best blooded cattle in the State of California, bought from one of the best herds in this state. There are three bulls unsurpassed in the state, unsurpassed in breed, and the $500 is in the association as a part of the price of the herd.

Now, the way that this movement is built up we find has been a stimulus to the colony and it has been one of the finest things to show the helpful spirit of the colony. Mr. Morris sold us one of the best bulls that could be obtained and Mr. Frocozzle gave the statement to the State Office that it was the best animal that ever went off his place. We have the best breeders of hogs, who sent us superb animals because they knew these people in the colony were trying to get started in the right way with a small beginning and they wanted to help them along.

These people have their interests here and they know that we are going to help them develop their farms quickly and they have confidence in us. As the chairman said, they are practicing economy, and that is the tendency. The enterprise is free from anxiety which pursues a man when he buys as an individual.

And they are being taught quality in this very pointed way and they are striving to pay for their farms under the best possible conditions. Then they feel that they are building up a better community and a better California. (*Applause.*)

We had a visitor here from Colorado who attended one of these stock meetings and he found out that there had been secured through a little carelessness a large number of tubercular animals. He was astonished. One man, out of a herd of nine, had got seven. He didn't have the money to stand the loss of slaughtering them, yet to maintain the standard that we started here those tubercular cattle had to go out. The question was: What are you going to do about it? They were a little bit hesitant here about it, but what happened was that this community stood that loss. (*Applause.*) The man that had all good cows stood his share along with the man who had the bad cows, and that gentleman, who is one of the officials of Colorado, a member of their State Board of Agriculture, said it was not so much what happened here that mattered as it was the fact that it was the finest exemplification of civic pride and spirit that he had ever seen. (*Applause.*)

Now, this settlement, I think, has passed the dangerous stage; they have got their farms, those who have been here under cultivation. It is certain they are going to pay their way. It is the salvation of the community that it has not cost the State of California one dollar, for all the expenses are paid and they are making their contribution to the state instead of drawing something from it.

But I want to bring to your attention one fact today that makes me feel that considering the circumstances of this case, the strain they are working under and the handicaps that they have had, the fact that they are people of small means, and it is desirable to help people of small means, there is one thing which happened here which is in the highest degree unfortunate. They bought a tract of land here from wealthy men, but we are going to have to pay taxes on the fair value of the land. Now, that did not mean any difference to the former owner, but when he held it he paid only $1,000 in taxes. But this year, now, the land is in the hands of one hundred poor men who can not afford to pay high taxes, who need all their money for the development of that land, for improvements of all kinds; those men must pay taxes in the amount of over $3,900, or in other words, over three times the taxes formerly paid. Now, that is not a tax on values, that is a tax on civilization; it is a tax on human prosperity and it comes with crushing weight on these poor farmers. Here is one man, who paid $84 on his place when it belonged to the estate last year, and this year this poor man has to pay over $300. Now, when you have that sort of condition you realize that that money comes out of the toil, not out of the soil, and there is something wrong with that system of taxation.

Here is another case on another tract of land where the tax on it was only $2,700 when it was owned by a rich corporation; these poor people this year pay $9,200. And they pay more than that, because they pay on the improvements, on the cattle as well as on the land. That seems to me somewhat of an unjust tax, and it seems to me that the system is wrong. That is one of the things that ought not to be.

Now, there is another thing I want you people to understand. We have started here in this colony a kind of practical work for democracy, which, I think, is more significant and helpful than anything that is being done in this country. Here in Durham, in this colony, is the home of many farm laborers. Now, the fact that he owns property and that he is an intelligent man working for wages makes him take an interest in his job and is inspiring and is just as helpful as anything can be in civilization and civic life. (*Applause.*)

We have not in this country recognized that value; we have not made any provision for it at all. We are going to have more of that character and we have got to fix it so that they can marry and have a family; so that they can bring up their children and so that those children can have associates and independence. We can not do that the way we have been doing. We have been accustomed to the migratory hobo; the man living in town separate from his wife who is irresponsible. In this colonization system, we have the opportunity given for such men to have a comfortable home and to provide means of livelihood, which will give him food and a comfortable place for his children and his wife, which will offset the high wages of the city, and he will live under conditions of life that will be better for his health and comfort and that of his children; more so that he could possibly have in a city. We have tried to bring good people here to hold these places and I want you to go and look at the homes today. That is the best thing

here; that is the thing that is going to grow all over this country. See the children that are in those homes today. These farm laborers are going to be the farmers of tomorrow. (*Applause.*) They are going to be the kind of citizens who are going to serve this country in the future. (*Applause.*)

Now, that is enough along that line. I have talked longer than I intended to. Of course, I have got a purpose in bringing you people here. This represents horticulture. This was a settlement for mixed farming. We have bought eight thousand acres of land in Merced County that is better suited for fruit growing. We want to start that off this year. We want to get as much as that under control and put it into the hands, mainly, of soldiers as settlers. (*Applause.*) Mainly young men.

We have got to do this thing. We must start at once. We have got to get the land ready and plant it to peach trees and grape vines and do a lot of things. I never was so much interested in this subject before in my life, since I have had an opportunity to see its importance. I have had, in the last two or three weeks, all sorts of appeals for land from young men who wish to settle down upon it. Some of you people come down to Turlock some of these times in the next two or three weeks, when we get straightened out, and tell us what we ought to do. One man said last night, "I will sell out; if there is anything I have got that you want it is yours." (*Applause.*)

In the last three or four years there has been a constant pressure from young men who are coming out of the war; they are anxious to get established; they want to settle down. They do not want to live in town; they want this very thing. "I got into this thing, not of my own choice," they say. They are waiting down there to go to work next Monday morning, a number of them, down at Turlock. They are the very best kind of material.

I want to tell you that I have a class of forty young men in the university and I looked over them the other day and thirty out of forty have got buttons on, showing that they were in the war. (*Applause.*) Most of them finish their course this year and they want to go down there and start. They have come off the farms and they know what farm life is. There is no mistake at all; they feel that here is something which will put them in a position, where they can settle down and start on their life work, whereas, if they had to depend on a private enterprise, as they were doing before this thing started, they would have to go into salaried jobs and drive around, perhaps, never come to realize their aspirations which they have, and they would lose the best part of their lives and the best part of their enthusiasm in so doing.

So, I say, that instead of eight thousand acres, we should have eighty thousand acres. We had one hundred and seventy-seven applications the day before yesterday. We have only got three hundred farms.

I had a mother who called me up at half past ten o'clock last night, and I was a little impatient because I was asleep. I told her to come around the next day or write me a letter. She said, "Well, I am the mother of two boys, and we saw that you had got this Turlock district and we know all about the country; we know the land, we want to go there, we want to get homes there and I want to find out tonight if we can get a place there." (*Applause.*)

Here is something that makes one realize how much it means; how much of gratitude it means. And what we are doing is simply serving our own self-interest in the matter in what we are doing for these people.

Well, this thing started as an experiment with ten thousand acres of land. Last winter we could have had all the money we wanted, within reason; of course they let us fix our own figures. We had a million dollars; we wish it was two million now, of course, this thing has grown so that it is impossible to realize what it means.

There is a bond issue coming up, of ten million dollars. It is going to be the salvation of California; if the bond issue passes and if we have ten million dollars to go ahead with, we can carry this thing out as it should be carried out. There was a need for this thing. People had talked about it but there was no tangible solution of the problem until this thing started, and as the speaker said last night, there are twenty states who sent investigators to Durham, within the first year, to see the result of the experiment. It is a mighty challenge to public attention to look into this thing. Last year more than ten states passed laws, voting appropriations for such enterprises as this. Utah passed an appropriation of a million dollars; Nevada also; Washington five million dollars, and yesterday there came to Berkeley, just before I left, the son of the Commissioner of Agriculture

of Massachusetts. He brought a letter with him from his father, who said: "This boy has worked on the farm all his life and I want him to do anything you want him to do. I want to see how this thing is done, because, we must have it in Massachusetts. I want him to go right through the whole of these preparatory struggles."

Before this was a year old, we had had visitors from five foreign countries. Last week one came from South Africa, and we had one here today from Australia; that is because our problem is the problem of the world. It is the problem of how you are going to get people to have an enduring interest in the country. The history of the whole world shows that if you have a rural population that is all right the country is all right. I thank you. (*Applause.*)

The Chairman—I am sure you are very glad you came here today, amid some little discomfort, possibly, because you have heard a perfectly wonderful story. I don't think that you have ever heard the voice of hope and promise rise with greater vigor and certainty that it is true and can be verified. I don't think I ever heard a speech which had more meaning in it than that which we have just heard. I do not think we quite sense the importance of what is being done, unless we hear it told to us in this way. Dr. Mead says he has talked enough about Durham. For a thousand years Durham will talk about Dr. Mead and what he has done. (*Applause.*) The fruits that will result from it will be of incalculable benefit. Just think of a community that is as white as this, although it is a small one, bound together for the purpose of helping themselves climb up and having a definite plan for that climb. Think of the spirit that is going to be injected here. What kind of a school are these people going to build? What kind of teachers are they going to have to teach in the schools? How long are they going to stay in them? How devoted will their children be and how their parents will provide for them so that they will get the best results out of their education? What kind of animals are they going to breed; what cow paths are they going to choose? When you are breeding such animals, remember that you are breeding your own life's work in the ideals you put into a community. Something comes back that has originated in your own character. You are making citizenship and you are, in a way co-operating and making this a better world. It is an inspiring moment in our convention, gentlemen, and we all felicitate ourselves on the privilege of being here.

The next speaker will be Colonel Irish. (*Applause.*)

Colonel John P. Irish (Oakland)—MR. CHAIRMAN, LADIES AND GENTLEMEN: I was invited here to discuss from my standpoint what has been the range of California orientation. I stand here for fair treatment, to tell the truth about Oriental immigration and to tell the exact truth and, because I dislike to be misquoted, I have taken the opportunity to write down what I have to say, and I may also say something that I have not written down.

THE RANGE OF CALIFORNIA ORIENTATION.

By COLONEL JOHN P. IRISH, Oakland, California.

I speak as the President of the California Delta Association, representing two hundred fifty thousand acres of land; land which is not susceptible to division into small holdings for various reasons, which I will not take time to explain to you but you can readily appreciate, if you visit that great region at the delta of our two rivers.

For the last thirty years there has been a perceptible decline in the value of farm labor in Europe and in this country due to the rapid industrial expansion

of the world. During the time that the industrial expansion is going on the lure of that expansion will be upon the people, not only of Europe but of this country.

We farmers have got to consider the cost of farm labor and the cost of rural production.

The present vituperative discussion of the question of the Oriental people in California goes deeply into the whole subject of productive labor on the land. When we treated our treaty with China as a scrap of paper, and by the Geary Act excluded thirty thousand Chinese who were legally domiciled here, and by murdering and destroying the property of other Chinese, drove them out, there was created a shortage in farm labor, and this economic vacuum drew in the Japanese who came protected by a solemn treaty between their government and ours.

The Japanese now here constitute a fraction of one per cent of our population. Against this minute element many of our people are being lashed into a fury of apprehension, hatred and rage. There may be left amongst us those who are capable of calm consideration, and to such I venture to address myself.

The present storm was started by Senator Phelan's statement that an American company in Los Angeles had sold to Japanese 800,000 acres of land on the Mexican side of the Imperial Valley. The American company promptly proved this to be false, and proved that it had sold no land there or elsewhere to Japanese. The Senator then shifted the story of such a sale to Japanese by the Mexican government. That government promptly denied such sale and submitted proofs of the falsity of the charge. Not discouraged, the Senator shifted again the charge that Japanese women in this state are having children and declared that the government ought to stop it. (*Laughter.*)

A little retrospection ought to calm the temper of this discussion and confine it to the truth. When San Francisco was shaken to its foundations and leveled by fire, and thousands of its people had no food nor shelter, their cry for help went out to the world. The only country that heard and heeded was Japan. That government immediately sent a quarter of a million in gold to the relief committee, of which Senator Phelan was a member. A few months later the San Francisco school board kicked all Japanese children out of the public schools, and its secretary gave as a reason that the Japanese children did nothing but study in school and in the examinations took the prizes and promotions that the white children ought to have.

In that connection a statement was made that these Japanese were adults, and three teachers immediately answered that by saying that every Jap pupil in the San Francisco schools was in the grade and form suited to him. One of the grade school principals of California wrote a letter, which I sent to the President of the United States, in which he said that in twenty years experience with Jap pupils in the schools of San Francisco there had never been a shadow of suspicion in regard to the examinations at all. He said the children, from his personal acquaintance, were of studious habits and responsive to discipline and that they were a good example in this respect to the rest of the children.

Soon after this an organized anti-Japanese movement began, headed by an ex-convict.

The legislature began to take notice and passed an act, ordering the State Labor Commissioner to thoroughly investigate the Japanese in the state and make a report. To pay for this work the sum of $10,000 was appropriated.

The Commissioner took ample time in the investigation. He relied on the testimony of scores of white witnesses in every locality where Japanese were domiciled. He gave the name and address of each of these white witnesses. His report, based on their testimony, refuted every lie about the Japanese coined by the ex-convict and his followers. Now that report was a public document, paid for by the taxpayers' money. But the influence of the ex-convict with the state government was able to prevent its publication, and the taxpayers, who had paid for it, were not permitted to see it. In the foregoing is a record of absolute fact. Is it a record of which any decent citizen can be proud?

We have now entered upon another phase of the anti-Japanese question, and in this phase the same old lies, refuted by that report, are in use once more, and the politicians who eat their bread in the sweat of the taxpayer's face, are shouting them from the housetops.

Since that report was made, what have the Japanese been doing? Nothing but working and by their industry adding to the wealth of the state.

In our country the normal flux and change of affairs always following a war, has been displaced by abnormal conditions. The hands of men are raised against our government. Anarchists advocate destruction of our institutions. They destroy life and property by bombs. The I. W. W. teach murder and arson as commendable occupations. Organized labor, under this radical leadership, strikes destructively. In our own state tons of food have rotted on the docks because the stevedores refuse to move it. Seventy-five per cent of the local tonnage of this state is affected by water transportation, and all water borne tonnage has been forbidden for months by a strike, which threatens death to all who would take the strikers' places.

In the East several hundred thousand men have struck, and murder American citizens who claim the constitutional right of free men to work without paying Sam Gompers for a permit to do so.

One man, alien born, orders all coal mining in the United States stopped on November 1, and no coal taken out until the miners get a six-hour day and a five-day week. When this autocrat proposed to suspend rail transportation, knowing that the railroads had a coal supply on hand for only ten days, he ordered suffering in tens of thousands of American homes, illness to the well, death to the sick and the children. Yet to listen to the politicians, the only danger visible is that from the Japanese. Why?

Are there any I. W. W.'s amongst them? No. Are there any Japanese anarchists? No. Are there any Japanese bomb throwers? No. Are there any Japanese mobs busy murdering men who want to work? No. Are there any Japanese groups teaching resistance to our laws and the destruction of our institutions? No. Then what are they doing? They are at work. "But," cries the alarmist, "they should not be allowed on the land."

Why not? The Japanese have had but little independent access to the good lands of California. They found the sand and colloidal clays of Livingston cursed and barren as the fig tree of Bethany. On that infertile spot the Japanese wrought in privation and want for years, until they had charged the soil with humus and bacteria, and made it bear fruitful and profitable orchards and vineyards. Now white men, led by these Japanese pioneers, pay high prices for land that was worthless, and grapes purple in the sun and peaches blush on the trees, where all was a forbidding waste until Japanese skill, patience and courage transformed it.

The refractory, hog-wallow lands stretching along the east side of the San Joaquin Valley, were abhorred and shunned by the white man. But the Japanese Sakamoto, seeing that they were in the thermal belt, began their conquest for citrus orchards. He persisted. He won, and now vineyards and orchards cover the hated hog-wallow land from Seville to Lemon Cove. And Sakamoto, the pioneer of it all, owns only forty acres of that vast conquest, and is called a "menace" to California!

These same experiences were repeated on the bad lands of the state.

We now produce a rice crop valued at $30,000,000, on hardpan and goose lands that were not worth paying taxes on. But it was Ikuta, a Japanese, who believed those lands would raise rice, pioneered that industry and produced the first commercial crop of rice raised in the state.

The anti-Japanese agitator represents that people as parasites. The fact is that wherever the Japanese has put his hand to the pruning hook and plow, he has developed nobler uses of the soil, and land values have rapidly risen.

The statement is made, and was recently published in a "Chronicle" editorial, that when Japanese begin to settle in a farming district, that district is ruined for the occupation of whites, who get out of it as soon as they can. Of course that is a falsehood. Its refutation is seen at Livingston, where Japanese were the pioneers and now are outnumbered 8 to 1 by white settlers who have come there since Japanese enterprise proved the value of the land.

In Sonoma County, near Santa Rosa, was a barren hillside, so infertile that it hardly produced weeds. On its highest part was a spring. A Japanese secured a contract on it, dug out the spring, securing an increased flow, laboriously fertilized the sterile soil, and now gets $800 per acre from it in strawberries. In the same county is an area of sterile hardpan land, called "Starvation Flat." A Japanese has taken it, sunk a deep well, and is slowly and laboriously conquering the rebellious soil, and soon that area will be a picture of fertility and prosperity; and anti-Japanese agitators will point to it, as they do to the strawberry garden on the formerly repulsive hillside, as proof that the Japanese are usurping the best

land in the state. The fact is that from the reclamation of the tule swamps, promoted by Mr. Shima, to nearly every acre owned by Japanese, until recently, they wrought upon the leanest and the poorest land in the state, which white men would not touch, and by toil and sacrifice made it as good as that which was naturally the best.

Now it is proposed to expel them, not for their vices but for their virtues, and every Japanese oppressed by brutal legislation and expelled, can hold his head high erect in his own country and say, "I was excluded from California for my virtues, my industry, my skill and the benefit I was to the land and its production."

The Japanese with wives were all married according to our laws. The women are amiable, good wives, mothers and housekeepers. It is false that they work in the fields. Their children, admitted to our schools, will make good and useful Americans. But the cry is raised that though only about one per cent of our population, they will outbreed, outwork and outdo the other 99 per cent of white people. If this be true it proves a degeneracy of the whites which would be a just cause of alarm. The field is open. Economic law repeals all statutes. The way to combat the Japanese is not by lying about them, and depriving them of the common, primitive rights of humanity, but excelling them in industry, in foresight and enterprise.

Now I read in the Chico morning paper something that I deeply regretted. Amongst other propositions is a proposed boycott of Japanese products in this state. Very well, but you must have labor in this state to perform the primary processes of agriculture, and especially so in the delta which I represent. I don't ask any of you men to sell your land to Japanese, but if we must sell land to the Japanese, whose fault is it? In the delta the whole question of agricultural products is a different thing entirely from what you have in the uplands and not in the delta. Millions of dollars have been spent in the reclamation of the delta lands, and that has been done by Japanese labor, the small men, the Japanese—that has brought about the productivity of the delta lands. I have farmed for twenty-eight years in California and this is my experience: I have been utterly unable to find a white man who does not need watching; who will do the work in the primary processes of agriculture which is necessary to be done there.

Now what shall we do? I don't want to dictate to you what you shall do with the land—your land. If you choose to sell it to Japanese that is your affair. You may refuse to deal with the Japanese or not. If I want to lease my land to Japanese that is my affair. We have Japanese labor on the ranch because it is the only labor we can get, to perform the primary processes of reclaiming these delta lands.

Now, I say I read something in the morning paper which I regretted. I don't know whether it is true or not. I don't believe anything I see in the papers. But I read that the Japanese, according to this statement—that the Japanese women are held as the common property of the men. That is an outrageous falsehood. I know the character of these women. They cherish their virtue as holy and rigidly as any women married under our law. They are raising a family of children; they are good women; good housekeepers and good mothers. They attend to the housekeeping interests and Japanese women never work out. The Japanese men do all the work of the house. The Japanese woman, wherever you find her, is a housekeeper and a mother and cherishes her children and honors her pledges to her husband in marriage. If they stain the record of their organization, then every man in that organization blushes scarlet, because that record is so stained.

Now, I am not asking for more Japanese here but I am asking for fair treatment and truthful statements as to those who are here. They came to fill an economic function, because by murder, robbery and persecution we had driven the Chinese out of California. In yonder state of Wyoming, 120 Chinese were shot to death in two weeks like rats. That was twenty-five years ago. Now what do we hear? We want the Chinese back. We are reversing things we said about the Chinese twenty-five years ago. But we must have men who will handle the great products of this state. We must have labor that will perform the primary processes necessary for production. Where are we to get it? I have tried to get it for twenty-five years. I have owned three ranches in this state, each in different locations, different in their physical characteristics. I have had experience with these farms and with farm labor in California and my judgment is—and I was born and reared on the soil and I am going to die on the soil, and my funeral expenses will be paid out of the products of the soil—my experience is that unless

you have labor that will perform these necessary primary processes then there will be a very great ensmalling of agricultural production in this state.

Experiences like these are enlightening. They are paternal in their nature. I do not propose to antagonize any of these people. We have to have labor to supply the necessary primary processes and I can not get white men to do the work that these Japs have been engaged in. You buy your potatoes from Utah or Nevada, but am I not to be permitted to put my land to the highest state of productivity and supply the market if I can? I claim the right of an American citizen to manage my land as I choose in order to have it in the highest state of productivity and to produce the most food for the people. That is my right as an American citizen. Here stands one man whom I know by bitter experience can not manage that land, can not maintain its productivity, and another man who by experience I know is highly successful and is an intelligent farmer who will maintain its fertility and maintain its highest productivity.

You say I must lease my land to this fellow? I won't do it. I will let my farm go into grass and go into hell before I will do it. That's the way I feel about it.

I ask you in behalf of the delta lands to adopt the policy of telling the truth about the Japanese. When they have done right, tell the truth about it for an inspiration to them.

They haven't a monopoly of all the virtues or of all the vices of the human race, but I claim they are entitled to credit for virtue, industry and intelligence and for the persistency which they have manifested. Japanese seldom get cold feet. No matter how hard it is, he persists in that hard job until he finishes it.

Now, I am not trying to tell you that the white man is the equal of the Hindu and the Mexican and every other form of labor in California, but the best and most industrious toilers I have ever had are Japanese. The Japanese are not land men, but they are single crop men. They will raise potatoes and only put in potatoes. In the delta, where two-thirds of the potatoes are produced, we can not raise potatoes on the same land two years running. The Japanese farmer, however, is a variety farmer. My Japanese foreman, who has been with me ten years, has had in one year six different crops on his land. Here are beans, yonder onions, and so on. They raise poultry and fish; they live better on a more sustaining diet because they have their own gardens and they raise their own vegetables and eat them. Their standard of living and their diet is something the white man would do well to study.

Now, that is all. I ask for them fair treatment. I ask for them that that which is true be told about them. If they do wrong, say so, without exaggeration. But I say now to you, gentlemen, cease propagating these falsehoods and these lies about the Japanese women and other things that are not true.

The Japanese are not reliable on their contracts, they say. I have done more business with Japanese than anybody in the State of California and I never have had a Japanese sidestep a contract. I have treated them justly. I have heard tell in my career of a man losing thirty thousand dollars by signing notes for a man in a bank as security, and of the two men only who paid the notes so signed, one was a Japanese, the other was a nigger. The other man was white "folks."

Japanese civilization is not based on contract. Chinese civilization, like ours, is based upon contract. In China the contract is a sacred thing and they keep their contracts as other nations in Christendom and do not fail on their contracts. But Japanese civilization is based solely upon honor. Two men making a bargain, one man says he will pay so much money and he will keep that agreement honorably, not because of a contract, because they do not understand contractual relations. The Japanese can not realize that the foundation of the country means commerce; but we in the public schools, in the primary schools, and universities teach the principle of contract. But in Japan that is a superficial function. We have contracts at the foundation of our civilization. Our whole legislation has been predicated on what is called the integrity of the American business man and against the dishonesty of the American business man. We are trying to correct the evils in business by establishing contracts and by teaching it in our public schools. But the Japanese did not know what a contract means in the same way that our children did not know what is meant by maintaining the tenets of commercial honor. The Japanese hold to their agreements under a sense of honor and not because of the contract. But that is all I say about the Japanese.

I hold no brief for the Japanese. God knows, I have no praise for Mexicans, or Hindus. But I do ask that those Japanese who are here be treated fairly and be granted the common rights of humanity; that their children shall be taken into the public schools where they will soon become Americans and help to maintain industries and become an economic asset in the State of California.

Here they are; let us treat them fairly. Why should we talk about their acquiring land? They dealt with us honorably before they knew what a contract was.

Our nation and other nations went to Japan and made contracts for land adjoining their cities and in that way Americans, Englishmen, and Germans got ownership to millions of dollars worth of property in the cities of Japan by virtue of a contract that they made when those people did not know what a contract was and paid absolutely no taxes to the Japanese government. They took the case to The Hague and it was tried at The Hague and the decision of the authorities at The Hague was that it was a contract, and the property is still owned by white people in Japan and it pays not one dollar of taxes for the maintenance of the government which protects it.

So, we have our own position with them too. A little introspection is good, sometimes. We have our own faults, and if we realized them more we would have greater charity for the faults of other people.

Now in respect to the statements that I read in the morning paper, let me say that I know the Japanese in San Francisco and when I see such statements made about them I lament that my countrymen are capable of so little consideration for the principles of right and of justice. If we have become, ourselves, so degenerate that we can not compete with anybody, then we had better bring in some virile blood, strengthen our backbone, reinforce our veins and arteries with red blood and we will not shake and tremble and fear about the Japanese. I am not afraid of them. I am a Caucasian. I am an American. I am old enough to remember when I started to work for $18 a month and when I built a house I built it myself. I did not have to have anybody come in and tell me how to build it. I did it myself. I believe that is the American spirit.

But we have this shortage of farm labor in California. It exists all over the country. There is a shortage of 100,000 men in California and 70,000 in Nebraska. I have a report from Dean Curtis and Colonel Ames, and they show that we have a shortage of labor. When a family of six or eight boys grows up, we know they are going to have the lure of the industrial centers. The boys grow up and where are they going to? They can not live on twenty acres or forty acres, six or eight boys; they must go somewhere and they will go to the industrial centers. I am not afraid of the Japanese or of any race on the face of the earth. I have confidence in my race, and having a confidence in my race I am only sorry that there is among the American people in the last thirty years an indisposition to work and especially to work on the land. I can not be blind to that. I have tried to overcome it for twenty-five years. I have tried to engage men to work for me. I have had men who sleep in as good a bed as mine, here and in Kern County, and who use the same bath as I use, and eat at the same table as I eat at, and as soon as they get a little money together and more work is offered them they answer always: "No, I am going to have some fun. It is my money and I am not going to work."

We are having a little bit too much fun in this country and a little bit too little work. The Japanese is here. You may boycott what they produce, if you choose; you may break commercial intercourse with Japan, if you wish to, but Japan is one of the greatest customers of this American Pacific coast.

I belong to an organization which, some years ago, started the sugar beet industry in California at a certain profit. Let me tell you that our own state can produce all the sugar consumed in the United States. Why doesn't it do it? Because the longlegged, longbacked white men won't do the work in the sugar beet fields at any wage. That is the reason.

Can you think of it as an economic proposition? Granted that we have the latent capacity for production in California which would furnish labor at white wages to hundreds of thousands of white people for the primary principles of agriculture which must be performed; but the white man won't perform that labor and won't perform those principles. We bring labor in here which will, and they are conquering the bad lands, cultivating sugar beets and, if fostered, the beets would be manufactured into sugar and we would be practically free from foreign

imports the year around because we have no severe winters to hinder the production. If we had that industry in this state it would be hard to beat it and thousands of white people who want to go into an industrial occupation would find profitable business in the sugar industry. But we don't do it.

The Japanese don't work in the mills. Why should we stand for all this sort of thing? Why are we not self-supporting? Because our longlegged, longbacked labor won't perform the primary principles necessary to their production.

I don't say that we should bring any more in. I have never said I wanted to have more Japanese in California, but I stand as an American citizen on the foundations of the principles of justice; mindful of my Quaker training, I stand for fair treatment and truth as to the Japanese, because the Japanese are here and because they are a real economic necessity in this state.

I may have spoken contrary to the opinion of some of you; I don't know. With my customary frankness I have told my story. I have no facts upon which I give my opinion. My facts are based on my own observations. My deductions from those facts I have stated and I thank you.

The Chairman—Gentlemen, we have heard a very interesting exposition of one side of this great question. I think that everybody here has within his own consciousness and experience his answer to the argument advanced by the gentleman who has just spoken, who don't agree with Colonel Irish, and who have some convictions upon this subject. I presume they have retained those convictions.

Mr. Irish—I do not doubt that.

The Chairman—It would be interesting to discuss this matter further, only, upon this platform, I presume it probably would be profitless.

The next speaker will be Mr. Al Lindley of Stockton, who all his life has devoted his best intelligence to the betterment of the farming industry after recovering from the degeneracy of being a politician. I am sure we shall profit as well as be interested by what Mr. Lindley has to say to us today. (*Applause.*)

Mr. Al Lindley (Stockton)—LADIES AND GENTLEMEN: Our presiding officer made a mistake. He has not known me as a politician; he knew me as a commissioner, except that I will say I had discretion enough to align myself with the Republican politics. (*Laughter and applause.*)

I believe this is the last word in this week's most interesting, educational, and agricultural program. There has been assigned to three very learned professional men and one very unlearned farmer a discussion of the problems of American agricultural development.

When I received from Commissioner Hecke the compliment of being selected to participate in this program, I was delighted, but when I looked over the subject that has been assigned to me for discussion I was overwhelmed.

PROBLEMS OF AMERICAN AGRICULTURAL DEVELOPMENT.

By AL LINDLEY, Stockton, California.

The man on the farm each day has confronting him agricultural problems that he never has been able to solve; problems that are in his every-day life and which he can in no way cope with, and for me to appear before an intelligent audience and try to discuss problems which relate to agricultural development seems ridiculous and probably will be; but I have heard the exposition of what Dr. Mead has attempted to do here, which is wonderful, and I have had a very interesting urge in what I heard of the old school of oratory by my friend and neighbor, Colonel Irish.

The old school of oratory is when a man speaks from his heart to the people instead of from his lips to the gallery.

Now then, the problems we have to discuss are too vast for any one to grasp, let alone to express by words in the attempt to find a solution. The problems are problems of nature and human problems. It is a problem that is involved in every wind that blows, for every expression of Nature, every ray of sunshine, every night of darkness, has to do with agricultural development and presents a problem that the farmer has to contend with just as he has to contend with crop diseases, with pests and harmful insects, and the problems of insect pests, birds and animals, those are the problems that no one yet has been able to solve after generations of farming. There are still problems for the solution of which we must look to the Almighty. We have now got upon a scientific basis where some of the smaller problems which confront the farmer may be solved by the Agricultural Department or university research. And these are most helpful agencies—and I would also mention the weather bureaus—these are helpful agencies that give us to a certain extent some assurance against these many troubles.

To my mind the most important problem we have to solve as farmers is connected with the development of this country and is a problem that concerns our relation to our government.

When I heard Dr. Mead, a while ago, give us an illustration of what was the practice, I presume, in this country I take—although this country has always stood for good government—and I make no criticism of its officials—but when there is this three-fold increase in taxation simply because a piece of land is subdivided and put into useful operation in the interest of the state and in the interest of the county through which the community must be advantaged—when taxation is increased to the extent of 300 per cent, I say there is something rotten in Denmark. (*Applause.*)

These things, my friends, are the things that are wrong all this country over. Those things are the things that will never be righted so long as we farmers sit around on a cracker barrel and discuss this government, but don't do one thing to align ourselves together in the conduct of the government. It is time that we are aroused and we who own property should try to enact laws which are righteous and for the benefit of mankind; and it is time that we are aroused by the fact that none of us farmers possess in this day as much influence in the affairs of the government as a hodcarrier who belongs to his local union, and there can carry his griefs, fancied or real, into the heart of our President and will be heeded.

I take pride in the hodcarrier who has been able to bring his strength and the development of his powers into legislative matters and matters of government to such an extent as to be a politician to a far greater extent than the farmer, whose impotence results from his negligence and the indifference of our own agricultural people. Our agricultural people have been sitting back, allowing the destinies of the world to be guided by their fellowmen, having nothing to do with the control of the government upon whose operations the future development of American agriculture depends.

It is our fault that we sit at home and allow each year, hundreds of millions of dollars to be taken from us that we are justly entitled to through marketing processes that are now in effect, through taxation as it is now carried on, through unjust representation and unfair methods which have been adopted by people who have no direct interest or connection with the farm. Those are the people who now mold, plan and philosophize on government so far as it pertains to the American agriculture.

In this last war our closest connection with the government came through the production of more crops and buying Liberty bonds and so on. We were called upon to produce those crops and we were glad to be able to buy those Liberty bonds and we continued to do both until the war was won. But we certainly are not such fools as to believe for a minute that we are properly treated in having to do our part in those two wonderful works and channels and in not having one single thing to do with the management of the government; one-half of whose expenses we paid practically and one-half of whose policies we represented, practically, and not one thing to do with the control or management of the war itself.

This I do not claim was the fault of our government, but it is your fault and my fault that we did not get off the perch and come down and get among the people and take our stand as good American citizens instead of allowing things to be run by our representatives, and insisting that we have the right to take part in the government in proportion to the importance of our production, and now we are here to account for our folly.

None of these things we have today, but as we sit here we likewise agree that this was probably our own fault. I think you are more in harmony in that statement than you were with Colonel Irish's sentiments that he has just expressed. I like them to be in harmony with me more than they are with you. One thing is vital, that we must see to it that if we are going to protect ourselves from the iniquities that are now being visited upon us, we must bestir ourselves. I do not say that we, on the farm, are not living pleasant lives. We have our griefs, we have our cares, but we have our comforts and the satisfaction of living independent lives. It seems to me that we have duties that we owe to the government itself. We are confronted in this nation by a crisis which threatens its integrity and that condition exists simply because you and I have neglected our opportunities and neglected our duties to align ourselves with the government and not be represented by radicals, wildeyed radicals and idealists, academic gentlemen who have no practical knowledge of the affairs of the men that are supposed to represent and who produce the situation that makes this government possible and prosperous.

I want you people to understand that it is an outrage, to my mind, that we who have been producers under the great adversities, are now frequently charged as being profiteers who are advantaging ourselves at the cost of the government and to the injury of the war, actively, and to the injury of mankind. I believe that is a shame and a crime and one that could not exist if we were allied together in an organized body co-operating for one purpose and putting our own people in charge of our own affairs. (*Applause.*)

We need nobody to guide us. The average farmer has average brains. As Dr. Mead has told us, we are working in these community colonies on lines which I believe will prove themselves to be of such success and with so much courage that I believe we are solving one of the great problems of the world in this land colonization scheme to get the American people back to the land. But I believe, as Dr. Mead said, that we are here in the position of having a lack of touch with the affairs that will give to this movement, as to all movements of the kind, the urge and the fostering care of the government.

It is to me a shame that we can be charged as being profiteers, as I say, when we go through the hardships we have, when we get the crops of fruits and almonds and such things as those that are paying to us only a fair price for our labor. We need through our co-operative organizations to bring to the mind of the people memoranda of the days of a few years ago when we were digging up our grapevines and our fruit trees because they were an incumbrance; when we had to support ourselves with our courage rather than with the results of our productions. I have sold peaches for $7.50 a ton and had them rejected. I want to tell every fruit man who is sitting here that they have had the same experience, and yet they charge us farmers with being profiteers and we sit back and with no word to the contrary in denial of it.

We have to send our products from the farm down the river into the markets until they get into the hands of the final consumer and it is a fact that potatoes brought less than 2½ cents per pound and onions less than 12 cents per pound. Our beans we don't sell at all; they are laying in the warehouses unsold. Last year's crop—the thresher was running at my place on this year's crop with last year's crop on hand. I wish we had the whip hand on governmental affairs in proportion to what we are entitled to, then we would not mind the situation we found in Seattle less than two weeks ago with Japanese ships at the harbor or wharves unloading beans clear up to the hatchway by the hundreds and thousands of sacks, raised in Manchuria, shipped by Japanese vessels, manned by Japanese sailors and unloaded in this country in opposition to the crops of beans in our own land which are not sold, last year's crops, while these beans are being sold and we are not getting back the cost of production.

Mr. Irish—Excuse me, right here, while we are upon that subject with beans laying in our own warehouses. Certain authorities are exporting them by 16,000 tons monthly.

Mr. Lindley—I don't know that it is better, Colonel, for the Japanese to raise those products in their country and ship them in their vessels and send them here in competition with unsold crops of our own than it is for the Japanese to be here and raise them for us and to be allowed to sell them out of our own land. That is as far as you will go?

Mr. Irish—That is all right.

Mr. Lindley—We are charged with the cost of those things. I was brought to a realization of that this morning and I want to show you something. There is a 10-cent sausage which I got for breakfast at a splendid hotel this morning. (*Producing a sausage.*) I got four of those little sausages for 40 cents. Then there was 15 cents for coffee, and yet we wonder why we have Food Administration throughout the United States. That is one example of the high cost of living. I got four pieces like that (*indicating*) for 60 cents on a dining car.

I don't think we should be accused of being profiteers with crops because we could not get more out of ten acres or out of a hundred acres as compared with those prices. Invariably we suckers, the farmers, take a man out and show him our biggest crops and show him what wonderful production we have and we do our best and then we are called profiteers, but they never see the shady side of it. A business man always insists, no matter how people rush into his store, when he is asked how business is, he will say, "It might be better."

We are glad to show what we produce and then we are faced with the charge brought against the farmers that they are asking an exorbitant profit. But with the price of things today we are justified in charging large prices for we have been faced with large expenses. Farmers in the past years have been carrying mortgages from year to year and not able to pay interest on the mortgage, let alone being able to cut down the amount of the mortgage. With the price of potatoes 2 cents and the price of beans 6 cents, and the price on onions 2 cents, and the price of beef which we get, 9 cents, and the public charged 11 and 12 cents, it would justify anybody who is consuming these goods that we produce, not believing that we are naturally getting larger prices for our products. But those people who are getting those prices, it is their funeral, not ours, and it is up to the government to solve those problems. But we can not expect them to solve it if they are their own robbers.

Now, gentlemen, I want to leave with you just one word, and I apologize to Mr. Van Norman for delaying him. I want to tell you to get into the game of governmental affairs. Seek every office that there is an opportunity for you or your neighbors to get. Try to take a hand in every political function or meeting. Try to avail yourselves of a little of the gall of the politician who is trying to develop the great political organizations. Otherwise you will continue to suffer from unjust taxation, impractical drainage legislation and irrigation legislation, which are regardless of our affairs so far as they relate to agriculture. By that means only can you obtain some reparation and some consideration in the affairs of our government.

I do say this, that it is not for ourselves and our self interests; it is for the interests of our government, that is now on the apex of the most critical time that it has ever been faced with since the Civil War. For all these wars in Europe, serious as they were, terrible as they were in the loss of our boys, and in the sacrifices we had to make—no wars, no dangers, no sufferings can be compared to conflict amongst ourselves. And my word for it, when men rise up—I have no brief for either of them—when men rise up and say that people shall freeze and children shall die because "we won't work unless we have our way," and other men in business say that "we will starve before we will concede one iota"—when that condition can prevail it is time for the people of this country, through their own government, to have control of their own affairs, to justify them in believing they will have wholesome food and wholesome and enlightened surroundings, when the time comes. Our government is darned near chaos today. I believe and I feel that this government is going to take hold of this thing and is going to clean itself and take control.

Any man in this country who has a white man's blood in his veins and is an American citizen—you can, almost without question, take him to be a good law-abiding citizen. You can find not one farmer out of ten who is not a lover of exemplary and conservative government, under the law and the constitution. And if we are in the majority as law-abiding citizens, then why should we allow this government to get into the hands of ultra radicals and idealists who are about to disrupt our government and interfere with agriculture and with the integrity of our country and its standing abroad?

It is for you, gentlemen, to wake up to that situation. Not that we have the greatest love of country and are entitled to it on that account, not for the reason that we want to get all we can out of our business, but that we have a love for that undying and benign protection that it has been to us during the last half century.

I hope some word I have spoken will make you men go to political meetings of either party—it does not make any difference to me what party—and take a hand in governmental affairs and prevent the catastrophes which confront us. We want this country for Americans; we want it for the American people; we want it for American agriculture. American colonies like this can only develop so far as they are protected by this government and the laws of this land. I thank you. (*Applause.*)

The Chairman—Gentlemen, you have had a good speech from Mr. Lindley, as you had the right to expect from the unselfish industry with which he has devoted himself to the benefit of agriculture in California in recent years. We certainly have been enlightened by what he has said. The subject which he presents to us is one which has many angles and it is one on which we may profitably dwell.

I now have the pleasure of introducing to you Professor H. E. Van Norman, Dean of the University Farm School of Davis. (*Applause.*) That is rather a new institution but it has developed very rapidly and very satisfactorily with tremendous strides and its fame has extended throughout the land. It has entertained and instructed students from every quarter of the globe and has sent them back to carry to every corner of the universe the story of California greatness and the perfection with which she has worked out her industrial problem. Dean Van Norman came to it in its infancy and under his control and leadership he has put it in a position of which we are proud and, Mr. Van Norman, we shall be glad to hear from you. (*Applause.*)

Professor Van Norman—MR. CHAIRMAN, LADIES AND GENTLEMEN: It is rather a difficult task that is laid out for me, to be the caboose of a train that has been filled with the character of speeches and the character of orators that have preceded me on this program for the last five days. I am only going to take advantage of that natural human trait to talk about the thing that is plain to me. For I notice that most of the speakers have talked about the thing that comes closest to them. It is hard for most of us to detach ourselves from our own self interests and view problems from the national or community point of view; and yet I am going to speak to you of agricultural needs and problems from my point of view, namely, that of the young man.

You know, we are pleased sometimes to criticise the expert because he can not do the thing which he says the other fellow should do when he points out that the thing is not done right. There is not one of you who does not reserve the right when you look on a picture to say whether you like it or not and tell where the artist fell down; yet most of you probably could not do as well.

THE YOUNG MAN IN HIS RELATION TO AGRICULTURE.

By H. E. VAN NORMAN, Davis, California.

I want to speak from the standpoint of the young man in his relation to agriculture in California. I see the sons of thousands of men and women who come through our schoolrooms in the years that I have been working with our educational institutions, and they have their own problems and they work them out according to their own inspirations.

A year or so ago a young man presented himself at the office from the university—a young man from San Diego County. He had just ten dollars in his pocket. Well, the registration fee was five dollars and there was five dollars to be deposited the first month; the room rent was $4.50 if he took the cheapest room we had. His books would cost him ten or twelve dollars the first month and his

board would be $25. He had ten dollars to do all that with. The clerk wanted to know what he was to do. I told him to send him in. I was curious to see what sort of a fellow had presented himself. He seemed to be as reliable as any young fellow who ever came there and presented himself for registration. I asked him how he happened to come there, and he said, "I wanted to study agriculture and they told me the farm school at Davis was the best place to go." "Well," I said, "how do you expect to manage it?" He said "I don't know." Well, there was no suggestion to help me there, so I finally said to him, "Well, now, it is a pretty uphill job you have undertaken, but I will waive the registration fee for the time being and you keep your five dollars and buy a meal ticket and you will still have five dollars to come and go on." Then I told him where the jobs were around. After that I said, "Now, you go out and see if you can get your work done and don't report for too much study and have time to learn and time to work; and come back in two weeks and tell me how things are going."

He came in to see me two weeks after that and I asked him how he was getting along and he said, "Fine; I have paid all but one dollar on my fees and books; I have paid my board and got my books." I said, "How have you done that?" "Well," he said, "I went down the street and I saw a tent. There did not seem to be anybody who knew who it belonged to, so I moved in. I got a job waiting at table and I got a job doing janitor work."

That fellow got through that semester. Next semester he was in the barn milking. He said he had got an odd job there and next summer he was going to school.

I have told you that story to show you the spirit that characterizes the way in which many of the young men in this state come into my acquaintance and I have told it to you to emphasize this thought: There are thousands—literally thousands of young men who are ambitious to be on their way to becoming land-owners and farmers. Many of them have little or no idea of what they have got to go through before they arrive. But I want to point out to you that land ownership usually involves—I exclude those young men who are fortunate enough to have inherited or accumulated a competency, I exclude them from my consideration and speak of the other classes—land ownership involves ten, fifteen or twenty years of effort. It involves the accumulation not only of money, but the accumulation of experience.

I want to plead with you for aggressive co-operation, to the end that you may put the young men of your acquaintance or in your community into the right attitude towards these problems, that they shall not allow the size of the problems and their difficulties to make them feel that they are hopeless.

It seems to me that most boys enter the office of a great manufacturing establishment, or a grocery store or a dry goods store realizing that they must start from the bottom at that kind of work and climb up step by step and that it will take ten or fifteen years before they will be superintendent, or manager, or owner of a great establishment which represents social wealth. But yet when the parents of other boys have the ambition to see their boy go into agriculture they expect to see him go into college and at the age of twenty-one step out of a three or four years' course a trained manager of fifty or a hundred thousand dollar investment along agricultural lines.

I am continually confronted with that misconception of the possibilities of agriculture. I wish there were some way, somehow by which we could develop the realization that ownership of land—and they tell us that the average farm means an investment of sixteen to twenty thousand dollars—that the ability to manage a farm can not be accumulated except through time and effort. There is no short cut to it, except possibly by reason of the short cut or aid of this land settlement plan. But that only goes for a part of the time and a part of the investment necessary. You must have a minimum of fifteen, twenty or twenty-five hundred dollars to even get one of these farms. You must have back of you an accumulation of agricultural experience and a reasonable prospect of winning out and ultimately to pay back all such money as is advanced within the time that is granted you to do it.

So I say I am particularly interested at this time in developing the spirit of young manhood. The realization of land ownership requires time and the accumulation of money and, more important than all, the accumulation of experience. This, perhaps, would be more worthy of emphasis with a city audience than with a country audience, for the young men coming in from the country realize these things.

The next point is this, and I wish to emphasize this point: The laborer of today is the land-owner of tomorrow. That is just as inevitable as any other great economic, political and social law that we have. Go back through the history of this country. New England was settled by the Pilgrim Fathers and for a hundred years these New England farms have been managed and the sons of the Pilgrim Fathers have become the owners of the farms. Bill Jones's boy was hired by neighbor Smith. In due time Bill Jones became the owner of land in that county. When the great lands in the Middle West were opened up he became the laboring man out there and he blossomed out and today he is the emigrant and his sons generally are farming in New England, in place of the live young men who went west. He has gone back to his father's place. You go into the western country and you will find these men have become the owners, the Swedish and the German immigrant who came in became their laborers, but they are the owners of the land. You come into our own California and you have the Portuguese and the Swiss laborers. The dairyman of fifteen or twenty years' experience is a land-owner. It is the inevitable law. Whoever is willing to be the laborer of today, out of that class shall be the land-owners of tomorrow.

Therefore the vital problem is to have our young men of America see that if they are to be the land-owners of tomorrow they must be willing to pay the price of being the laborers of today.

I am very much interested in this question that Colonel Irish referred to about our Japanese. I am not very much concerned with the phase to which he referred, of the character of the Japanese; I am only concerned with this question, Do we want him to be the land-owner of the next generation? (*Cries of "No."*) If we dont, we have got to so adjust our affairs that he will not be our inevitable successor. What difference does it make to Colonel Irish, if I can use the language of the ordinary man, whether these farms are farmed or not? I venture to say he has got money enough to carry him through to twice the old age that he is likely to reach.

Colonel Irish—You are entirely mistaken.

Prof. Van Norman—Do you follow me? Now, if you want this land to be farmed by their children then we had better buy our onions from Italy or Japan or somewhere else than to let men come into this country and tend it, if you don't want them to own any of it. If you are willing they should own the land they are working, then it is all right. But I am not very much interested from from the standpoint of the inclusion or the exclusion of the Japanese. I am interested from the standpoint of the future of our American farms and the ownership of the land. (*Applause.*)

Sir, we shall be remiss to them and to the generations that come after us if we don't put out our best efforts to solve this problem and if we don't allow our boys, through mistaken notions of life, to have access to the land and allow them merely to congregate in the cities. And if we refuse to put it in their way to do that, to go on to the land, and because they have congregated in the cities, another people come in and take the land, and in time we realize that it is a mistake, then it is too late to help it. And again, if our boys leave the land, because of some fancied and erroneous point of view and they go to the cities and our cities become over-peopled, our country becomes under-peopled and the cities will starve and revolution will be rampant.

The farmer does not need more, in one sense. There is hardly a farmer who, within the possibilities of his own family, can not support himself, and feed himself. The city man can not do that. The city man can only feed himself when you and I on the land produce not only what we need but a surplus to send to him.

I believe firmly in the great economic law of adjustment. I believe there is no hope for the city people, speaking as a whole, except the realization that the farm must be attractive enough to get enough people on the farm to supply those people who do not want to live on the farm. (*Applause.*)

My salary has not gone up in six years. My meat bill, my milk bill and other bills have gone up, and speaking broadly the city has got to pay the price for those who live on the farms, and become consumers rather than producers. And just in proportion as our agriculture becomes more attractive more of our young men will stay in agriculture.

I am not interested in the back to the land movement, as I have said. I do not believe that that can be a very large factor in it. The solution is going to come because your boy and your neighbor's boy discover an opportunity to stay on the land.

We produce more boys in the country than we can keep in the country interested in a country like ours where we grow rapidly—perhaps not always as rapidly as the real estate men would like us to grow. But, speaking nationally, we produce more boys in the country than we can possibly keep there. Now, the business of farming must be attractive enough, so that sufficient of those boys will stay there to produce food for those who go to the cities. Therefore, I am interested in seeing our young men tided over that period of dissatisfaction and discontent and unrest and exaggerated impressions of the call of the city, and settle in the pursuit of agriculture for which men are best fitted.

I believe very firmly in what Mr. Lindley suggested, but I am putting it in a slightly different way. I am making it personal. I believe in the responsibility of each of you to think out loud in your community. That is what we need in America, to think out loud in our community.

If you do not think out loud in your community on this Japanese question, whatever you and your neighbors think, this is what it will be, that if you sit still and keep your mouth shut, you have no fault to find with what happens if we are represented in our government and in our legislative halls by the wrong type of men. It is not the fault of the man who is there, it is the fault of the men who let him get there. It is a democracy, this thing we talk about; and yet some of us refuse to live up to our share of responsibility—me, myself, I am part of the community. We must think out loud. We must see to it that there are elected men whom we want to represent us. If our legislature is composed of fifty per cent, or sixty per cent, or seventy per cent of lawyers instead of farmers, it is because the farmers helped to elect them.

If the men who do the talking in our labor unions are Russian Bolsheviki, it is because the American labor unions do not do the talking when they should. If we farmers are allowing a lot of radicals to come into our organizations to do the talking, it is not the fault of the talker, it is the fault of those who let him in.

We want fair play everywhere. We are American citizens and as belonging to democratic institutions we must think out loud. The reason the farmer has lost out is because he has something to lose. He has property values to lose. But we must not forget that he has something else to lose. He has suffered some one else to perform his duty as a citizen and as a part of the community while he, the farmer, has remained silent.

It is not only that, but the farmers should be co-operators. California was settled with bold and venturesome men who had nerve and confidence in themselves to lead their families into independence. They came across the prairies, those tired men who made California self-supporting, and they were confident of their own power to protect themselves. They settled upon land many, many miles from their neighbor; they were not asking anything of any man except the chance to do their part by themselves. But the times have changed. We can not work that way any longer. We have to learn to work together and we must in our communities develop the spirit of working together.

There exists right around here, and you realize it in what has been said, one of the greatest lessons today, not merely in blossoming homes, but in the fact that there are a hundred farmers here who can work together; who can subordinate their own personal pride and, sometimes, selfishness, sufficiently to elect the best buyer to go out and buy cows for a hundred of them. That is the thing that has made this corporation that we find here possible. They had the directors pick out the best man to do the task and they paid him money enough to have it done right. That is what made the thing possible; they picked the best man to do the task.

In the same proportion that our communities—our agricultural communities learn the lesson of the city, to work together and pick the best man to do the task—in that proportion will we improve in those things which require community action and community effort.

I have been very much interested all the time in this discussion of prices, the high cost of living, and all that. I believe we are not going to help it one bit by legislation. There is only one thing that is going to help it and that is to commence a propaganda, to talk out loud until we correct the point of view of the most of our people. We must go to work to correct our system of handling food products.

Potatoes sell so that the farmer gets two cents and we pay twenty-two cents in the city. There is nothing to blame the middle man for in that. Don't blame him at all. Half of you would step right out and do the same thing in

some other way, perhaps. The middle man is there because the reward appeals to him. If we have too many middle men we must find some way to eliminate the unnecessary middle man. I don't believe many individuals are taking an unholy profit, but I believe we have an unholy number of middle men. (*Applause.*) We will not eliminate them by legislation. We can only eliminate them by improving our system of society and our social organization.

When the farmer combines, as he has done in the citrus industry, and provides the machinery which will serve the purpose, and the farmer also serves the purposes of the consumer at a less cost than any other system, that system will survive. And then we are going to handle these other things.

We had in our town one butcher and he made his living off of the community. Three times in the time that I have been in the community other men have come in there to see if they could not make their living off of the community. Fortunately for some of us they failed before they got to the point where we were supporting two butchers when one was all that was necessary.

Now, I believe that is the thing that has to be worked out somehow, some way. Our economic organizations, our investigating bodies, our city clubs have got to give some thought to how we can develop machinery by which the product will come from the farmer to the consumer with the fewest middle men. I do not believe we shall do that by legislation. We have got to develop a system against which the individual can not compete and thus add burdens to the existing burdens of society. There is, especially in a city community, a psychological state. I believe very firmly that as a democratic nation we are going to find some way through our problem among ourselves and bring about, some way and somehow, something that is worth while.

I am an optimist. I believe in the future of this colony, and in the future of this nation, in spite of the lack of information and the other things that are upsetting us for the time being. They give opportunity for some people to become discouraged but some people's ambition is neutral. Undoubtedly one thing is sure, if they will think out loud and exchange ideas and information, as a nation we shall ultimately prevail. (*Applause.*)

Colonel Irish—Just a moment, Mr. Chairman. My name was referred to by the speaker. Thank you. I wish to say, young man, that I thank you for your argument. I have worked as a farmer for twenty-five years and I have worked as hard as any man. I got one of your students from a farm school to come in to my ranch and he worked hard for three years. Now, he is a land leasor. He is a Japanese.

Professor Van Norman—My answer to that, Colonel Irish, is that if the sons of the American farmer do not want to pay the price in hard work they will not be the land-owners of tomorrow. The Japanese, the Swedes, who are willing to pay the price, will own the land. Therefore, if your boy and your neighbor's boy will not stay, the coming of the Jap is inevitable. That is all I want to point out. We must realize that we must take our choice. We must pay the price if we want to preserve the land ownership.

The Chairman—Before we close I will ask Director Hecke to say a few words to you, probably with reference to his chosen message.

RELATION OF THE HORTICULTURAL CONVENTIONS AND CALIFORNIA AGRICULTURE.

By G. H. Hecke, Sacramento, California.

Mr. Chairman, Ladies and Gentlemen: Before we close, I want to say a few words in regard to this subject of the convention, and I want you to take this opportunity to inspect this land settlement in Durham. First, a few words about the horticultural conventions. They were started in 1882 and the conventions have been continued ever since. Not one but has been of great value in the discussion of questions affecting California agriculture. There has hardly been a convention in which something of vast importance to California agriculture has not been done. At these conventions since 1882 there has always been a reporter at hand and the reports have been issued after each convention and the records of the doings of these conventions have been historical. Possibly,

many years from now our children will study these reports of California agriculture and California agriculturists will look over those that are preserved and they will give important ideas to the farmers of this state after we are gone like the old pioneers; like the mother of Judge Shields, who always was a faithful participant in these earlier conventions. In these reports you will find all the activities of these men and women and what they have done for the uplifting of California farming.

Speaking for the present convention, we have had a splendid meeting and the co-operative efforts of last Wednesday by representatives of the large farming organizations of California will be of help. We expect great things to be done by the representatives of these different organizations representing possibly fifty to sixty thousand people under the leadership of Mr. Teague, which, I hope, will accomplish what Mr. Lindley has spoken of today in the exercise of influence through understanding the agricultural needs of the day.

In the agricultural measures which come before the legislature, no matter how friendly the senator or the assemblyman might be to the agricultural necessities, the fact that we are joined together, as farmers, favorable to certain legislation, or that we are against it will influence them in their attitude towards such legislation as is proposed by these large associations which will form an agricultural clearing house for legislation and an agricultural grand jury of investigation.

Some have asked why we have called you here for this outdoor program. It is to give you an opportunity to come and give the farmers of the colony an opportunity to hear the subjects that we have discussed. As director of this convention, which is held under the auspices of what was formerly the Horticultural Commission and now the State Department of Agriculture, I wanted to give the speakers an opportunity and enough latitude to practically choose their own subjects. So the broad subject that was put into the program today was the possible future development of California agriculture, for I feel that we are competent to discuss anything. This gave Colonel Irish his opportunity, and Mr. Lindley his opportunity, and Dr. Mead has spoken and also Professor Van Norman, who has fittingly closed the discussion this morning, and I want to say right here that I am in absolute sympathy with the discussion of Mr. Van Norman. That is, that the laborer of today is the land-owner of tomorrow. I believe in that absolutely. I believe in the establishment of such colonies as this under the leadership of Dr. Mead. I believe we can demand such legislation, which will increase such activities as we have here. I thank you. (*Applause.*)

The Chairman—I agree with Director Hecke that we gain much from such conventions as this and I have seen many lessons learned and the results put into practice during the preceding year. All conventions of this kind are helpful and I think every one of them has given good results. You have got new enthusiasm and a new vision, new standards, new ideals and a new ethical conception of your relationship to each other.

(*Here ended the fifty-second Convention of Fruit Growers and Farmers.*)

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