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U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF POMOLOGY,

G. B. BRACKETT, Pomologist.

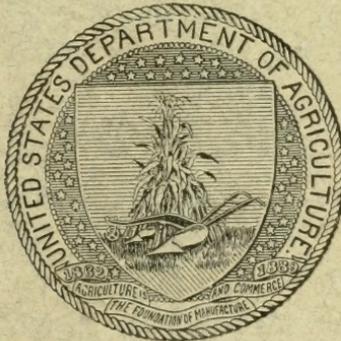
PRUNES AND PRUNE CULTURE IN WESTERN EUROPE,

WITH SPECIAL REFERENCE TO EXISTING CONDITIONS
IN THE PACIFIC NORTHWEST.

BY

EDWARD R. LAKE,

Professor of Botany and Horticulture, Oregon State Agricultural College.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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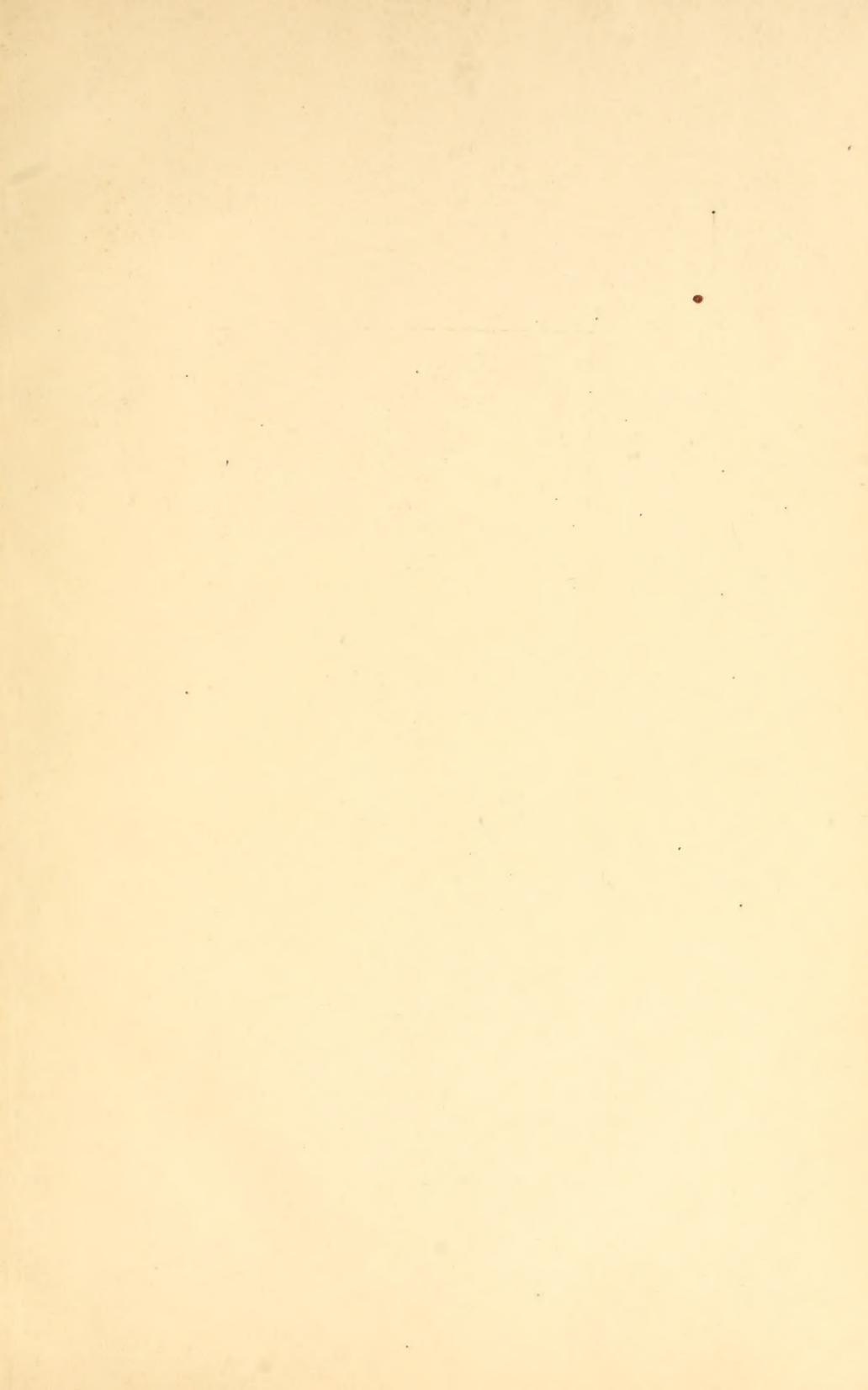
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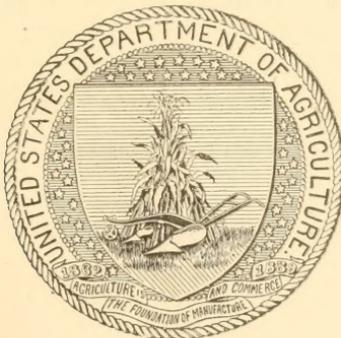
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LETTER OF TRANSMITTAL

DEPARTMENT OF AGRICULTURE,
DIVISION OF POMOLOGY,
Washington, D. C., June 19, 1901.

SIR: I have the honor to transmit herewith and to recommend for publication as a bulletin of this Division the manuscript of a report upon "Prunes and Prune Culture in Western Europe With Special Reference to Existing Conditions in the Pacific Northwest," by Prof. Edward R. Lake, of the Oregon Experiment Station. It also contains important references to the Mirabelle group of plums and their economic value in the countries visited.

The expenses of the investigation of which this manuscript is the official report were defrayed from the appropriation of the Division of Botany for Botanical Investigations. Credit is therefore due to Mr. Frederick V. Coville, Botanist of this Department, for his kind cooperation and valuable assistance in aiding this Division in carrying out the investigation made by Professor Lake.

This bulletin contains the report of a careful investigation of the economics of the prune industry in western Europe, more especially in France and Germany.

Very respectfully,

G. B. BRACKETT,
Pomologist.

Hon. JAMES WILSON, *Secretary.*

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PRUNES AND PRUNE CULTURE IN WESTERN EUROPE, WITH SPECIAL REFERENCE TO EXISTING CONDITIONS IN THE PACIFIC NORTHWEST.

INTRODUCTION.

The prune industry of the Pacific Northwest, including the States of Oregon, Washington, and Idaho, is to-day the foremost pomological interest of this section. Beginning with a few trees planted by the late Henry Miller, at Milwaukee, Oreg., in 1860, and a commercial orchard planted near Portland, Oreg., by Dr. J. R. Cardwell, in 1871,¹ the plantings have increased until at present there are approximately 50,000 acres of commercial prune orchards in these three States. The estimated value of this acreage, together with equipment, including apparatus, evaporating and packing plants, is \$20,000,000.² Of this acreage at least 20 per cent is of the variety known as Agen ("California," "Petite," or "French"), and the remainder, or 80 per cent, is of the variety known as the Italian prune (*Fellenberg*), and it is with especial reference to this latter variety that this report has to deal. There are various other varieties grown in small quantities in an experimental way in this section, but as yet only the two above mentioned, together with a so-called "Silver" prune (Golden Drop, *Coe*), are of commercial importance. This latter variety is rapidly passing out of commerce; in fact, the trade journals in 1900, almost to a unit, did not give quotations on this fruit. The authority quoted above has estimated that a light crop of prunes for the Pacific Northwest for the year 1901 would yield approximately 40,000,000 pounds of the evaporated product, while a full crop would be not less than three times that amount. On the basis of the prices received for the crop of 1900, the fruit of the Agen being included in the estimates, an average crop of the prune orchards of this region ought to yield not far from \$2,500,000 per year, on a basis of the present acreage. It is quite probable that the income would be much larger if all of the crop, taking one year with another, could be saved and the product put upon the market in a uniformly high-grade style. With the rapid increase in bearing acreage since 1894-95 there has been a decided decline in

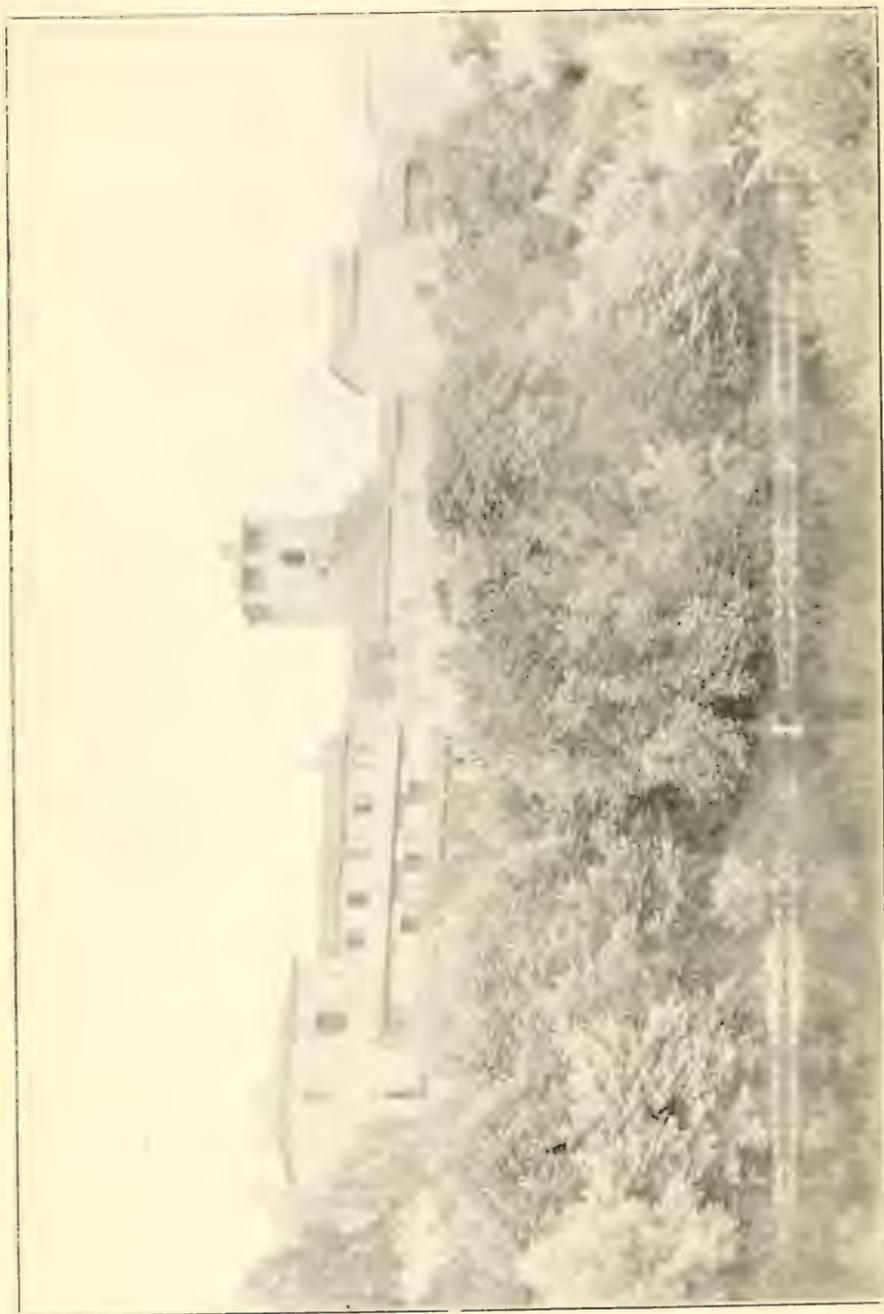
¹Grafting wood of both the Italian and Agen was obtained by the nursery firm of Miller & Lambert from Ellwanger & Barry, and to this firm (Miller & Lambert) is due the credit of having introduced the prune into this region.

²These figures are based upon extensive and careful inquiries first made in 1893, and supplemented by further investigations made in recent years by H. M. Williamson, a conservative authority.

the average market price of the product. No longer do the growers receive the large prices—8 to 12 cents per pound—that were received in the decade from 1880 to 1890; still, the present prices, which are somewhat higher than for the past three years (the average being $4\frac{1}{4}$ cents per pound for the crop of Italians of 1900), yield a fair remuneration to the producer. As the marketable output has increased and the price declined, producer and dealer alike have turned their attention to the problems of improvement in quality and extension of markets. Among the first phases of the subject to attract their attention have been the various problems relating to the proper curing of the crop. While endeavoring to solve these, the attention of the grower has been fixed upon the fact that the chief difficulty in the way of improvement lies not so much with the methods of curing as with certain rather undesirable characteristics of the leading variety itself. The climatic conditions of the Pacific Northwest are such that usually the early autumn rains begin, in one section or another, before the prune crop is more than half harvested, resulting not infrequently in the loss of much fruit by bursting, as well as retarding the work of harvesting and increasing the cost of evaporating. The Italian is also a shy bearer, taking one year with another, a feature that is probably due, in large measure, to the self-sterility of its pollen, though occasionally it would seem to be due to the prevalence of cold, wet weather at the time of blossoming. In the meantime those who have been looking for increased market facilities have ascertained that in some sections exception is taken to the cured fruit of this variety of prune on several points, viz, toughness of skin, tartness of flavor, large size of pit, etc. With these several objections in mind, together with the fact that the Italian has been found subject to a malady which manifests itself in a distortion of the foliage, locally called "curl," which threatens to be a more or less serious handicap in the cultivation of this variety, the more progressive growers have been gradually coming to the conclusion that a variety other than the Italian must be found for this section if the best results with this crop are to be obtained.

The Italian has been characterized as the "lazy man's tree" because it rarely, if ever, sets so much fruit that the operation of thinning seems desirable. While this quality formerly commended the variety, growers are now generally expressing a desire for a more prolific tree which at the same time will yield a fruit of the same type and possess the desirable qualities of the Italian.

With a view to ascertaining whether there are any European varieties that possess the desired qualities, or part of them, and are therefore worth introducing into the Pacific Northwest, a study of the prune industry of France, Germany, and Austria was made during the summer of 1900, and the results of the observations are embodied in the following pages.



THE ABBEY CLAIRAC.

The spot where the Benedictines planted the first prune tree in France.

THE EUROPEAN PRUNE INDUSTRY.

The prune industry of France is about a thousand years old,¹ and with a few exceptions due to the recent introduction of modern commercial evaporating and packing plants, it is carried on in much the same way to-day, so far as the producer is concerned, as it was four hundred or more years ago. While the industry is less than a half century old in America, and great changes have been made in the methods of producing the cured product, French methods have remained practically unchanged for centuries.

To the person familiar with the Pacific coast orchard areas, France offers a very disappointing field for orchard study. Her orchards would be called, more properly, fruit gardens. As such, of course they are extremely interesting and fraught with lessons to the American horticulturist. While it is true that one finds an occasional small area planted to trees in the way that is common in western America, yet on the whole the orchards of France are composed of a mixture of plantations of fruit trees and shrubs, ornamentals and other plants.

IMPORTANT PRODUCING DISTRICTS.

The chief part of the prunes of France are produced in the northern and eastern parts of the department of Lot et Garonne, a section of country approximately 2,000 square miles in extent, situated in the southwestern part of the country, about 45 miles from Bordeaux and nearly 60 miles from the Atlantic coast; in the northern and western parts of the department of Tarn et Garonne, which is somewhat smaller than the preceding department and lying just to the southeast of it; in the department of Gironde, which is the region surrounding Bordeaux; in the department of Deux-Sevres, a small section lying about 100 miles to the north of Bordeaux and 30 miles from the

¹The introduction of the prune into France is ascribed to the Benedictines, who brought it from Turkey or Persia on their return from participation in the Crusades.

The first trees were planted, so tradition informs us, at the Abbey of Clairac, located on the right bank of the picturesque little river Lot. This abbey, which was founded and given to the Benedictines by Pepin le Bref, King of France, about 752 A. D., is still standing, and is remarkably well preserved. It occupies a commanding position overlooking the valley of the Lot, and, though in the heart of the present village of Clairac, is a conspicuous landmark for many miles up and down the valley.

The location of the Abbey Clairac and the introduction by the Benedictines of the prune to this particular spot seem particularly fortunate, as the conditions were there most favorable for the introduction of this fruit into France. No other people at that time were so much interested in the cultivation of fruits and flowers as the monks, and in no other section of the country would this tree have reached the high development that it has reached here.

This is especially shown by the fact that there are more old prune orchards in the valley of the Lot than in any other section of corresponding area, and there are also more young trees being set out in this section at present than in any other prune-growing district of France (Pl. I).

Atlantic coast; and in the central part of the department of Meurthe et Moselle, an irregular strip of country lying in the northeastern part of France adjacent to the German border and along the Moselle River. The prunes from this latter section are of the "quetsche" type as distinguished from the Agen or *D'Ente*, which is the common type in the former regions. Several other departments also produce unimportant quantities of this fruit. The department of Lot et Garonne produces nearly one-half of the total output of France, which for the year 1900 was approximately 100,000,000 pounds, selling for an average of 4 cents per pound, all sizes. The same year the output of Agen prunes from California was about 130,000,000 pounds, selling for 3 cents per pound on the same basis as in France, while the output for the Pacific Northwest was probably not far from 7,000,000 pounds of Italians, selling for 4½ cents per pound, all sizes, and of Agen, about 5,000,000 pounds, selling for 3 cents per pound,¹ all sizes.

The chief prune-growing sections of Germany are the provinces of Baden, Elsass,² Lothringen,² and the Kingdom of Saxony. This latter region extends into Bohemia along the Elbe River and its tributaries from a point near Tetschen to Leitmeritz, a distance of 30 miles, more or less, and extending over a belt of country probably not less than 15 miles wide on the average, with occasional stretches extending farther. The Bohemian section of this district is of much more commercial importance than the Saxon section.

SOILS.

The soils of the prune-growing sections of France, Germany, and Austria are widely different in their physical and chemical characters. In France the soil is quite universally light, porous, rich in lime, and deficient in humus. The soil types known as sandy or argillo-calcareous (clay and lime) are considered the best for the prune, though pomologists agree that the plum in general is not very particular about the soil in which it grows, so long as it is neither too light and limy nor too wet. Certainly these two conditions in no wise prevail in the European prune orchards. Unfortunately, so much can not be said of all the orchards of the Pacific Northwest. But while the soils of France are generally of a limy and sandy character, those of the sections of Germany and Austria in which the prune is cultivated are largely clayey and darker, because having a greater humus content. These latter soils are more retentive of moisture, and generally the orchards are restricted to hillsides or gently undulating land, whereas in France there is little difference between the acreage on hillsides and in the valleys. The soil of the districts in which the prune is profitably cultivated in southern Germany and northwestern Austria

¹ Oregon Agen prunes were unusually small in 1900.

² Alsace and Lorraine.

resembles very much the average basaltic loams of western Oregon and Washington, while the soils of France generally resemble the soils of the eastern parts of these two States and portions of southern Oregon, though they generally carry a larger lime content than the Pacific coast soils.

ORCHARD METHODS.

In Bohemia are to be seen thousands of acres of prune orchards planted on the same general plan as our American orchards, with these differences: There are no large individual or corporate plantings, and prune trees are freely planted along the highways, lanes, boundary lines, and about the buildings as well as in orchards. An occasional single orchard block may contain 20 acres, and while this may appear quite insignificant to the large orchardist of the Pacific coast, it is very different from the French type of prune orchard, which is generally a very irregular and mixed plantation of fruit-bearing trees, shrubs, vines, and other plants.

With the exception of a quite limited region about Sainte Livrade and Villeneuve-sur-Lot, and an irregular and broken section in eastern France between the Meuse and Moselle rivers, the prune orchards of France are not planted in blocks or masses. The trees are set in rows, usually, though frequently there appears to be no attempt at regularity, and when in rows the rows are from 40 to 60 feet apart. Frequently three or four rows are planted side by side, the trees being approximately 16 to 20 feet apart each way. These zones or belts of rows are separated from one another by several rods of open field, and occasionally one such belt of rows, extending from one end of a field to the other or even from one end of the farm to the other, will be the full extent of the orchard plantation upon a given property. In the rows not only are prunes planted but there may be cherries, apples, pears, peaches, quinces, bush fruits, grapes, nuts, osier willows, and an occasional ornamental tree. Between the rows of trees are grown the various cereal, forage, and root crops, or in many instances the tract of open land is a meadow. Often an owner or renter will have a few trees in a certain locality and others widely separated from them. Not infrequently these different orchard plats are 2 or 3 miles apart.

The trees are never cultivated for themselves. Such tillage as the soil receives is given for the benefit of the field crops. It must not be inferred from this, however, that fruit trees are never cultivated in France. In the region surrounding Paris, where immense quantities of fruit such as cherries, plums, pears, apples, and small fruits are grown, excellent tillage is given the soil, but in this region, where land is very valuable, trees are grown close together—6 to 8 feet apart usually—and the ground is literally covered with other crops. Or the tree crops may be scattered or in irregular groups, and no particular attention given them save to gather the fruit.

The same course is followed in the German and Austrian orchards and tree plantations, consequently the trees of these various sections are generally much smaller than trees of a corresponding age on the Pacific coast. Pl. II shows a German orchard of Italian Prune trees that are nine years old. Pl. III shows a French orchard of Mirabelles that are nine years old. Fig. 3 of Pl. IV shows a row of Agen trees in a French orchard twenty years old. Fig. 1 of Pl. IV shows three rows of German Prune trees in France eighteen years old.

STOCKS.

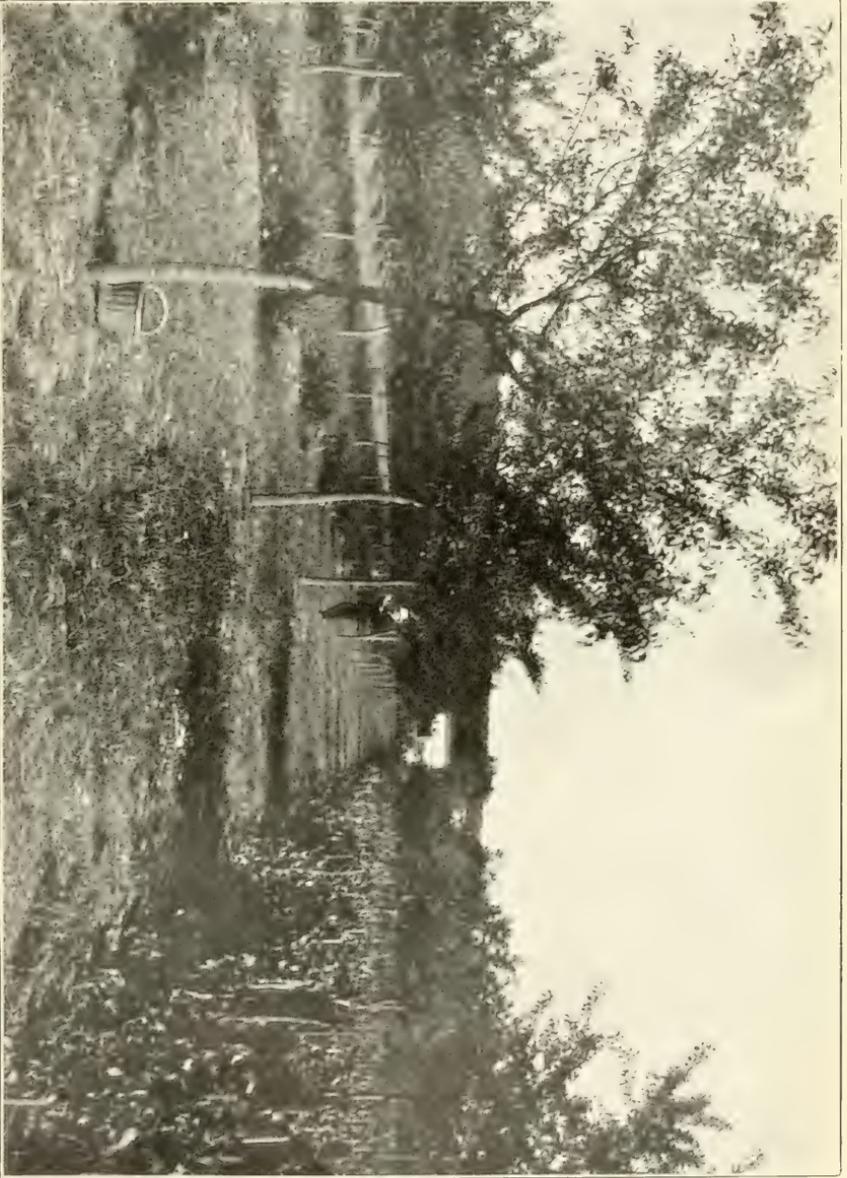
In the Pacific Northwest the peach is the common stock for the plum, though during the past few years the Myrobalan plum has been used to some extent. In France, Germany, and Austria all plums are grown on plum stocks, and occasionally this stock is used quite extensively for the peach. The common stock for the Agen is the St. Julien; for the "quetsches," St. Julien and White Damson; for the Mirabelle, St. Julien and Myrobalan. This latter is not regarded by the growers as a desirable stock, but nurserymen prefer to use it, and if the stock is not specified this is the one usually sent out. Growers assert that trees on Myrobalan stock are much shorter lived than those on St. Julien stock. How much real weight can be attached to this statement is not known, as well-authenticated experiments have not been conducted along this line. French horticulturists give as their reasons for using the plum stock generally for the peach, that it is a deeper feeder, lives longer, is hardier, more vigorous, and less susceptible to adverse soil conditions, and for planting near houses it is to be preferred to the peach, because it will send its roots deep into the cold earth below the basement walls and thus develop a crop under conditions in which the peach would barely live, except it should feed entirely from the adjacent border, which is desired for other crops. When it is known that a very large proportion of the peach trees of France is grown as espaliers on high walls and sides of buildings, the force of the position taken by the French growers and propagators is apparent.

PRUNING AND TRAINING.

In Europe the universal practice is to train orchard trees with high heads, the object being to let the sun and air have free access to the ground in order that the cover crop may have ample opportunity for development. Usually the trees are headed at a height of from 4 to 5 feet. Little pruning is done, save to thin out and occasionally to cut back the young growth if the trees are grown on land that is irrigated. The heads are usually round to roundish, and generally much smaller than in the case of Pacific Coast trees of corresponding age. The plum tree lives to a good old age in Europe and frequently is of large size.



AN ORCHARD OF ITALIAN PRUNE, NINE YEARS OLD, FREIBURG, BADEN, GERMANY.



A NINE-YEAR-OLD ORCHARD OF MIRABELLES.
The property of G. Wurstorn, Saint Max, Nancy, France.



FIG. 1.—GERMAN PRUNE AT EFFIAT, FRANCE.

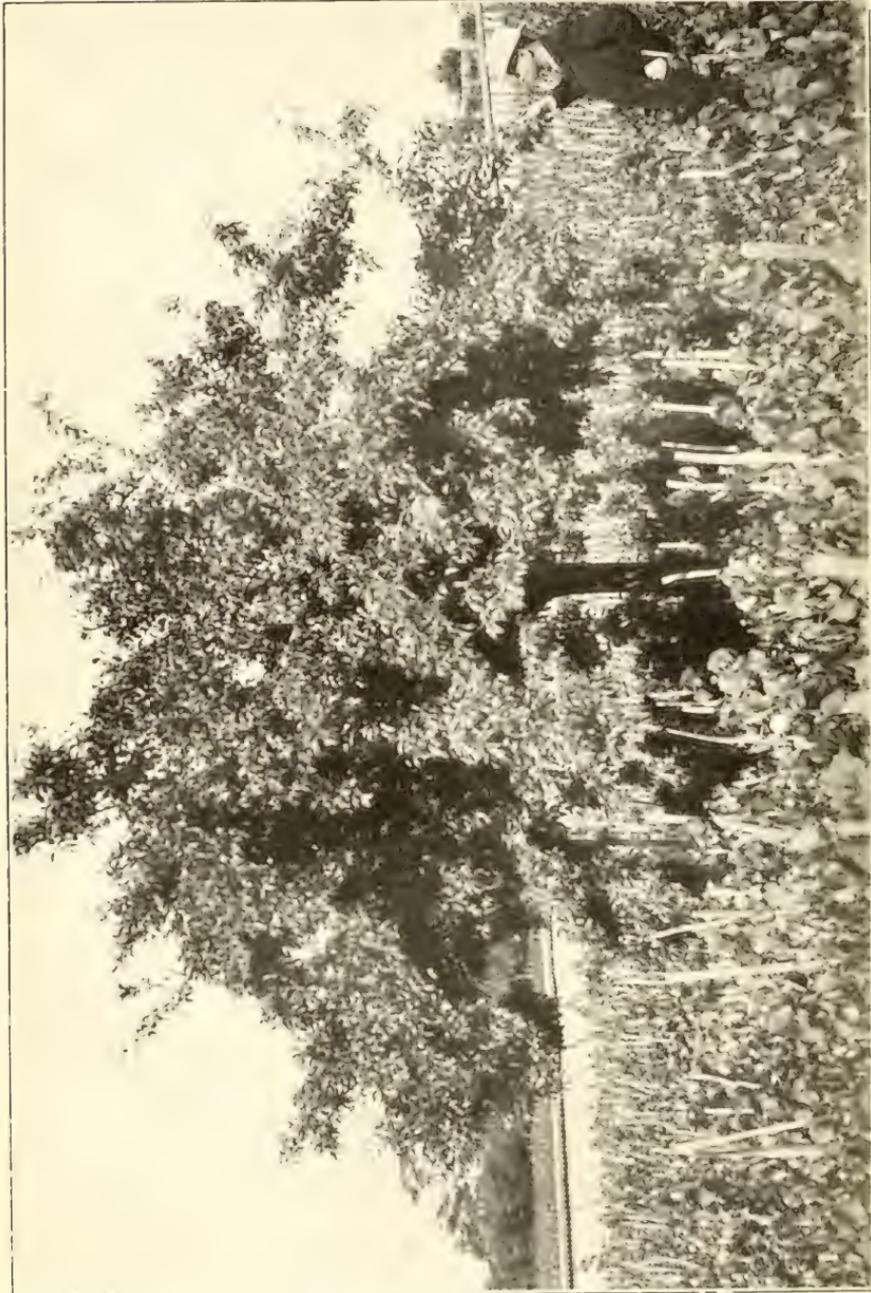


FIG. 2.—PRUNE TREES AT CARCASSONNE.



FIG. 3.—AGEN PRUNE AT VILLENEUVE-SUR-LOT, FRANCE.

TYPICAL PRUNE ORCHARDS OF FRANCE.



A TYPICAL TREE OF MIRABELLE PLUM, TWELVE YEARS OLD, SAINT MAX, NANCY, FRANCE.

In the "quetsche"-growing section of Germany and Austria the trees are somewhat larger than the Agen trees in France and approach the size of similar trees on the Pacific coast, though the style of pruning and trimming is the same in all sections—i. e., with high heads. The Mirabelle is treated in the same manner, though trees of this variety often attain a size considerably above that of the Agen at a corresponding age, and the spread of top is relatively greater.

Pl. V shows a twelve-year old Mirabelle tree that bore 12 bushels of fruit in the year 1900.¹ Other views of this style of training prune trees are shown on Pls. I, II, and III.

VARIETIES.

As before mentioned, the leading plums of France are the Agen and Mirabelle; of Germany, the common "quetsche" (German Prune of America), Mirabelle, and Italian; of Austria, the common "quetsche." The Italian is grown only to a limited extent at any point. It is produced chiefly in the province of Baden, in the vicinity of Freiburg, where it is justly esteemed, the tree being thrifty, vigorous, healthy, and rather more productive than in other sections. Though this variety has been known for many years and sparingly tried in most prune-growing sections of Europe, it is held as of secondary merit because of its shy bearing. French and German authors are agreed that the fruit is of large size and good quality, but that the unfruitfulness of the tree disqualifies it for their use. Were it a fruit which sold on the market in a fresh state this objection would lose much of its force, but as most of the evaporated fruit put on the markets is smaller than the Italian, size becomes a less important factor. The European producer wants a large quantity, for since he uses much of the smaller and inferior fruit in the manufacture of liquor, and only the larger grades for the evaporated product, there appears to him to be a disadvantage in growing a variety that yields a small amount of an extra large-sized fruit, the price of which is not enough higher than that of average size to make its production equally profitable with the smaller but more prolific "quetsche."

The Mirabelle type is held in high esteem by the French people, and would seem to be worthy of more attention by our Pacific coast growers. With the exception of the Reine-Claude type, which is grown in all parts of France, and notably in the environs of Paris, for consumption in both the fresh and conserved states, the Mirabelle is the type receiving the most attention at the hands of the French grower. It is used conserved, preserved, jellied, jammed, dried, and distilled. Great quantities of the canned fruit are used by the bakers for making "tarts," a most popular pastry in all the larger cities of

¹This tree stands on the property of C. Wursthorn, St. Max, Nancy, France.

France, and it is likewise esteemed for the same purpose in England. There are several varieties of this type, but the leading ones now catalogued are "Mirabelle grosse," "Mirabelle petite," and "Reine des Mirabelles." While these varieties differ in size, the important distinction is in their respective seasons of maturity, varying as they do from the 1st of August to the 1st of October.

The fruit of the average Mirabelle is about five-eighths of an inch in diameter, nearly spherical, of a yellowish color, slightly subacid and freestone. The especial feature that commends it to the French people is its size. When used in pastry one course deep it is just large enough to make a first-class tart, from the French point of view.

THE PRUNE IN COMMERCE.

Commercially considered the evaporated prune is apparently not now held in as high esteem as it has been heretofore. The people of Europe prefer the plum preserved in jars, cans, or bottles, in one way or another, to the evaporated product, yet large quantities of dried prunes are consumed by the middle classes, for the reason that the prices of preserved and canned plums are beyond their means. The chief reason, perhaps, for the decline of the prune in public estimation in Europe is that its appearance upon the market is in no wise improved over what it was twenty-five years ago, while in the case of all other fruits there has been great improvement in both the style and character of packing and packages. In America the recent rapid improvement in fruit refrigeration has worked harm to the dried fruit industry in that it makes it possible to materially lengthen the season during which fresh fruits of many kinds may be marketed at a price within the means of the well-to-do industrial classes, and thus the demand for evaporated fruit is perceptibly reduced on the part of those whose means would otherwise permit them to pay good prices for this product. It is safe to say, however, that the market for the evaporated prune will steadily increase if it can be supplied with a high quality of fruit, neatly and cleanly packed, which can be sold for a reasonable price. At present the poorer people of England, France, and Germany consume little fruit, relatively speaking. These people have a constant struggle to obtain the necessaries of life, and as fruit is held by most of them to be something of a luxury it is only consumed when their means is in excess of the amount required for necessaries.

There is a steadily growing demand in foreign markets for pitted fruit, and an effort is being made by some of the Austrian growers to meet this demand. It appears from a study of the situation that in the near future much of the better quality of prunes will be offered to consumers as "pitted plums;" especially does this appear to be the outlook for the Italian and other large varieties. Consumers do not

care to buy pits. This part, which costs the producer most in the consumption of soil fertility, has no value in commerce, at least in its present form, and a demand is being made to have it eliminated from the product. This change in the character of the marketable product of the prune would necessarily involve great changes in the process of curing. There is reason to believe, however, that the invention of machinery for pitting will eventually reduce the work of that operation, which is at present quite impracticable.

SECONDARY PRODUCTS.

As in the American orchards, so in the orchards of France and Germany, there is a large quantity of second-grade fruit unfit for the evaporator, or even, after having passed the evaporator, unfit for market as a plain evaporated product. At least nine-tenths of this low-grade fruit is distilled and put upon the market as "Prunelle" or "Quetsche," liquors that would be called plum brandies by Americans. Not only is the inferior fruit from the prune orchards manufactured into liquors, but also that from apple, pear, plum, grape, and small fruit plantations. In some localities, chiefly the large centers like Paris, Hanover, Berlin, and Hamburg, much second-class fruit is used for making jams, jellies, marmalades, and fruit butters. Of the plum jams or marmalades the preference in France and England is for that made from the Reine Claudes, while in Austria and Germany large quantities of plum butter and marmalade made from the "quetsche" (German prune) are consumed; but as an article of commerce this latter product is of a much cheaper grade than that made of the Reine Claudes; also, while it goes into the market in tubs, casks, kegs, and stone jars, the former is put up in glass jars, fancy cups, wide-mouthed bottles, and various other dainty packages. Of the jellies, jams, marmalades, and fruit butters put upon the European markets but few are made of plums alone. Plum juice and flesh are usually mixed with apple and currant and occasionally other fruits, and the resulting product goes upon the market as "choice" products under various names. The market demand for pure plum products of this character is quite limited, notwithstanding large fruit conserving factories have been endeavoring to place such goods upon the market. At present, outside of the Reine Claudes and Mirabelles of France, England, and Germany, a small part of the "quetsche" crop of Austria, and the Bosnian product of plum butter, inferior plums are used for distillation. Quetsche, especially when of considerable age, is ranked among the finest of brandies. The best is said to be made of half "quetsche" prunes and half Mirabelles. The present price for old Quetsche is 15 per cent above other brandies of corresponding age.

In the large cities and at points where fruit packing and conserving plants are established there are distilling plants of considerable size

which purchase from small dealers and growers such fruits as are unfit for general market purposes. In the rural sections and where orchards are small and scattered the distillation of waste fruits is effected by portable outfits, operated in very much the same manner as the American traveling steam wood-sawing machine. The method of conducting the work of these outfits is the same as practiced by thrashers, wood sawyers, and like concerns in America. A fixed charge is made by the hour or day, and all expense of running the alembic, as it is called, is borne by the distiller; the orchardist or vineyardist simply placing the properly fermented fruit in an accessible place. The charges for distillation vary with the seasons and kinds of fruits.

PACKING AND PACKAGES.

The one most neglected phase of the prune industry is that of packing and packages. In the marketing of no other fruit or food product, save possibly the coarser vegetables, is so little attention paid to attractive packing and packages. Not less than four-fifths of the product is put upon the market in large, rough boxes or bags, and especially is this the case with the smaller sizes of the European prunes and those from the Pacific Northwest. A few of the larger packing establishments of France, Germany, and California use a moderate amount of taste and a fair quality of material in their packages, while one or two French and German firms put upon the market a limited amount of very fancy packages of choice fruit. On the markets of the eastern United States and Europe prunes are usually handled like peanuts and potatoes. Instead of being handled as a prepared fruit food, they are treated as a raw article; exposed to the flying dust and dirt of the market place; shoveled and carted about just as one might handle coal, in old boxes, barrels, sacks, or trays. The result is that as the housewife passes from place to place making her purchases for the table the thought of dried prunes for sauce gives her a feeling of mild disgust, and justly so. If the average curer of prunes on the Pacific coast could see the article as it is commonly marketed in the large cities he would feel distrustful of his own senses. Not all of the evaporated fruit is thus handled, but a large amount reaches the consumer in this way. Not alone the smaller grades, though certainly a larger per cent of these are thus sold than of the fancy grades, but some of the fruit of 40-45 grade is sold with so much dirt upon it that the work of preparing it for the table must be as great as for potatoes. This condition can only be overcome by adopting a style of package that will not permit handlers and dealers to foul the fruit.

There appears to be no reason why this product under ordinary conditions, providing it is protected from attack by insects, will not

keep for two or three years without serious deterioration. Certainly there is no reason why it should not be placed on the market in such manner as to make it as attractive as the canned product, which is the chief competing article.¹ While it is possible that much of the evaporated product is of too low a grade and quality to warrant even a small additional expense for fancy packing, yet for all the higher grades and best qualities it would appear that this is a field worthy of thorough investigation by the progressive packer and shipper. In the world's markets to-day attractive packages count for at least as much as quality with the majority of buyers, and since dried prunes are looked upon by many as a coarse food it is the more important that careful attention be given to their market appearance. The glass jars, bottles, and cans in which some of the Bordeaux packers put up a portion of their fancy-quality prunes are too expensive for the general market, and yet, thus far, these are the only packages in which the fruit keeps for an indefinite period without decreasing in value through being worm-eaten and sugared. The great need at present is a cheap, light, fly and air proof package.

METHODS OF MARKETING.

There are several features of this phase of the European prune industry that are worthy of attention by our growers. One of the first matters to attract attention is the method of making sales at the country market place. This is where the crop changes hands from the small grower and evaporator to the dealer, packer, or shipper. Every considerable village of Europe has its market place. In the larger villages and cities the "market" is of daily occurrence; in the smaller villages, once a week. With the different villages within a more or less well-defined region, the market days occur on different days of the week, thus enabling buyers to visit different sections from day to day. One of the chief prune markets of France is Sainte Livrade, in the valley of the Lot. During the curing season there is held at this place every Thursday a dried-prune market—i. e., the prune is the chief feature of the "market." Early in the morning one may see the people with all sorts of conveyances—wheelbarrows, handcarts, donkey carts, ox carts, and carts drawn by men and women—traveling toward the market place with their prunes and other produce, and not infrequently may be seen both men and women carrying their marketable produce in hand baskets or sacks thrown over their backs. At a set time, usually about 8.30 a. m. for the prune market, the sound of a bell or horn announces that the market has opened. The buyer, with a little scale pan in hand, begins his

¹This year a San Francisco firm has put upon the market a package that bids fair to be the beginning of a better method of marketing this product. This is a 5-pound paper box.

work of testing. All about the market place, in boxes, bags, baskets, tubs, barrels, and other receptacles, are the various lots of dried fruit (Pl. VI). As the buyers pass from lot to lot the attending saleswoman—for usually a woman attends to this part of the business—sews, knits, eats, or converses with her neighbors. After the buyers have made the rounds and sampled the offerings, as to cured condition and size, they are ready to make offers on the various lots that they have decided are worth their attention. Each buyer waits upon the several persons offering the lots that he desires, makes his bids in a confidential tone and, if acceptable, the bargain is closed; otherwise he passes on and other buyers take his place, and so the round is made until all goods are sold. Occasionally, however, some lots are kept until the next market, the price offered not being acceptable to the seller.

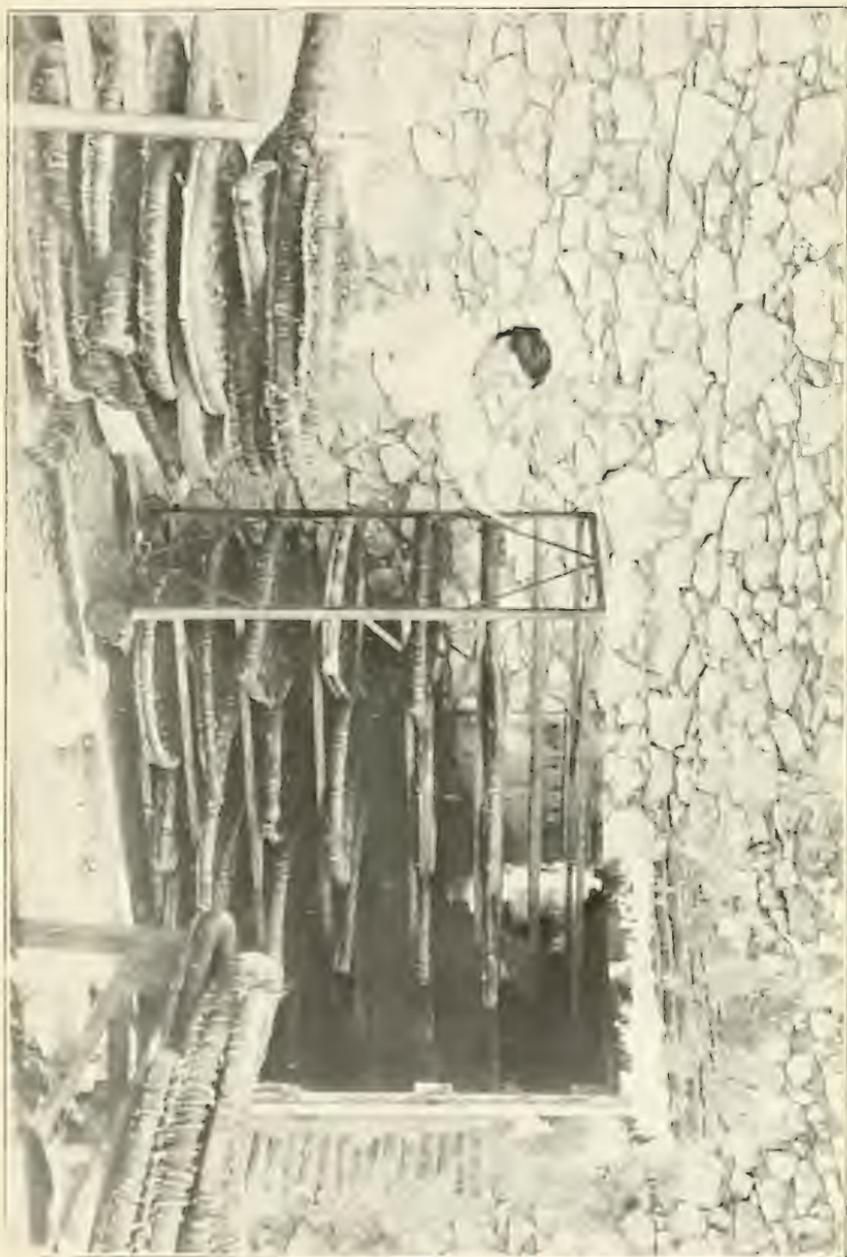
After sales are made the fruit is delivered by the seller to some warehouse, packing-house, or depot, where it is weighed and paid for. On being received at the packing-house the fruit of each grade, as determined by its cured condition, is put into large receiving bins. Such fruit as is insufficiently dried (and frequently the proportion of this grade of fruit on the market is quite large) is spread on trays, placed on a large truck, very much after the style shown in Pls. VII and VIII, and re-evaporated. The fruit that is properly cured is graded by means of a grader made upon the same general plan as the Cunningham grader used on the Pacific coast. Each grade is placed in a separate bin, and after a period of sweating put through a processing bath, the composition and method of use of which the packer endeavors to keep secret. The fruit is then boxed, sacked, bottled, or canned, according to quality, appearance, and size, as the market may demand. This feature of the work is not unlike the California method of processing and packing, which is quite unknown in the Pacific Northwest, though a beginning along this line has been made by one or two firms. The culls from the grading are distilled, sometimes alone, sometimes together with fresh fruit that is considered unfit for the drier.

In many localities, and especially in northern Germany, large plants for evaporating, canning, preserving, distilling, and packing are established, and to these the growers sell their fresh fruit. Some of these establishments have men and teams traveling over the country gathering up the fresh fruit. Sometimes the crop is bought on the trees, but more often after it is picked.

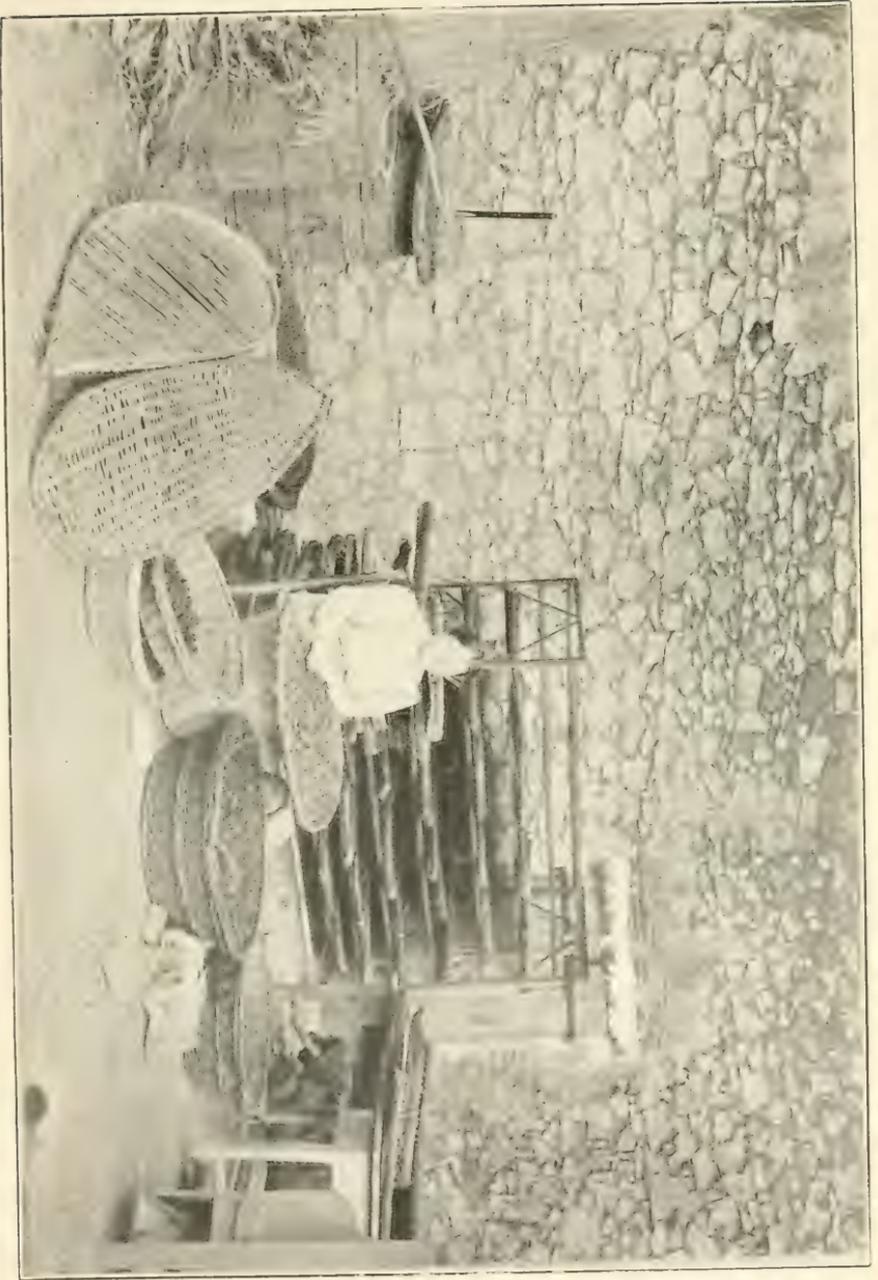
As to the question of large factories or individual small evaporators, the more intelligent European dealers and producers are advocates of the plan of having large conserving plants. They realize that the large plants can be more economically handled, can prepare a more uniform grade and a greater variety of product, and are much better able to cope with the variable market conditions; a sufficient number of reasons, evidently, for their view of the question. The history of



TYPICAL MARKET SCENES IN FRANCE—THE PRUNE MARKET, SAINTE LIVRADE.



AN EVAPORATOR OR ETUVE AND THE OPERATOR, VILLENEUVE-SUR-LOT, FRANCE, CHARGING WITH A FRESH LOAD.



AN EVAPORATOR (SAME AS PLATE VII), SHOWING ASSORTING OF PARTIALLY CURED PRUNES.



the growth of these fruit-food factories (for such they really are) in the Old World is one of much interest to the people of the Pacific Northwest, and it appears that it is only a question of time until our growers and dealers must adopt a system similar to that existing in France and Germany. The chief objection to the product of the Pacific Northwest to-day is that it is not uniform in size, quality, and pack, and that there is no certainty that an order placed and filled satisfactorily one year can be duplicated the next on a large scale. If, for example, the whole prune crop of the Willamette Valley could pass through one finishing and packing-house, there is no question, in view of French and German experience, that a fairly uniform grade and quality of product could be put upon the market from year to year and that a stable market rating could be secured for the prune crop of this section, resulting most beneficially to the industry.

EVAPORATION.

As intimated in a previous paragraph, a large part of the prune crop of Germany and Austria is evaporated in the large commercial plants, while of the crop of France over two-thirds is evaporated in the small, individual driers ("fours" or "etuves" as they are called there). Of the former of these methods little need be said, as in a general way the plants are constructed after the Zimmerman and Alden types of American machines and are less efficient, viewed from the standpoint of an American, than the improved evaporators now in use in the Pacific Northwest. The only feature in which these European plants excel the American commercial plants is that of making provision to use all inferior fruit in the preparation of various secondary products. If the fruit which comes into the plant will not make a good evaporated fruit, then it is used to make some other form of fruit product. In this latter respect our commercial evaporating plants have a great opportunity for improvement.

Of the system of evaporation in France more may be said, for the reason that the fruit prepared by this method brings the highest price on the European markets, and for the further reason that a brief discussion of this method will materially aid our growers in understanding what their present position is in this phase of the work of the world's prune industry.

As before stated, the prune of France is the *Agen*, commonly known on the Pacific coast as *Petite*, or *French*. For the first part of the ripening period it is allowed to fall to the ground, and if the weather is fair it is gathered every two or three days. Should the weather be foul it is gathered every day.

As shown by the prices paid at the first markets, as well as by the general appearance of the fruit itself, the first gatherings are of an inferior quality. As the season advances the trees are lightly shaken.

The fruit is gathered in common hand baskets (see figs. 2 and 3 of Pl. IX), usually by women and children, carried or carted to the building where the drier ("four" or "etuve") is located, and there, without dipping, washing, or grading in any way, is spread upon the drying trays, or "clais" as they are called. These trays are a most unique and interesting part of the apparatus. They are made of various shapes, sizes, and material. Some are square, some rectangular, and many racquet-shaped, others round, others oblong. Some are made of willow throughout, some of willow sides, while the bottom is a latticework of split broom-corn stalks or reed grass; some have a wooden framework and galvanized wire bottom, and others are made of woven rush grass. In sizes they vary from small round ones, 18 inches in diameter, to rectangular ones $2\frac{1}{2}$ by 4 feet, or as long as 6 by $2\frac{1}{2}$ feet wide. In one good-sized "etuve"¹ (a drier that will handle 12 to 20 bushels per day) may be seen half a dozen styles of trays varying as to size, shape, and the material of which they are made. The fruit having been placed upon the trays at the opening of the season, is put into the oven or drying chamber, which has been previously heated to a temperature of 70° C. (158° F.). The fire or heat is withdrawn at the time the fruit is put in, the chamber is closed tightly, and the fruit left for three days. During this time the fire is rekindled each morning, and when the temperature of the chamber has reached 70° C. the fire is withdrawn as before. At the end of the third day the fruit is removed, the chamber closed, the fire rekindled or heat renewed, and the temperature brought up to the standard, 70° C. While the fruit is out it is assorted roughly and the large prunes are dipped into red wine. All are then replaced in the oven, the heat or fire withdrawn, and at the end of twenty-four hours the fruit is again taken from the oven. This time it is assorted, all cured fruit being removed and put into baskets, the sizing being done by eye during the operation. The uncured fruit is returned to the chamber and such trays as may be empty are filled with fresh fruit. The chamber is then closed, and the process repeated from day to day until the crop is cured.

Pls. VII and VIII give views of a common style of evaporator near Villeneuve-sur-Lot, and the above description of the process of work applies to this individual drier. The little details of the process of curing vary more or less with the individual, but the above is in the main the method followed by those growers who put upon the market a good cured prune of the French type.²

¹A "four" is a simple bake oven. The fire is kindled in the chamber, which is usually small, and when the heat has reached the proper degree the fire is withdrawn, and the trays of fruit are placed in the chamber and doors closed.

²The process here outlined differs somewhat from that described by Messrs. Nanot and Fritschler, the French authorities on this subject, but it is in accord with the most advanced general practice followed in the Lot-et-Garonne district to-day.



PRUNE-HARVESTING SCENES IN THE RURAL DISTRICTS OF FRANCE.



ONE OF THE ORIGINAL TREES OF CŒUR DE BŒUF PRUNE, CARCASSONNE, FRANCE.

NEW OR LITTLE-KNOWN VARIETIES.

The following new or little-known varieties were found at different points during the course of the investigation, and young trees or grafting wood of each of these was secured for experimental introduction to the United States.

Cœur de Bœuf (*Beef's heart*).—So named from its characteristic firmness, is, according to the best information that can be obtained, the offspring of a variety introduced from the province of Lerida, Spain. Raymond Moise, of Carcassonne, France, says:

There was introduced from Lerida in 1854 among other trees a plum. From seedlings of the fruit of this tree the present variety was brought out in 1879. The tree (Pl. X) is vigorous, hardy, a regular bearer, and the fruit a long keeper, and, our people here think, of excellent quality.

The following notes taken at Carcassonne would seem to indicate a little confusion as to the time of introduction into France.

There is only one established orchard of this variety of any considerable age, though there are several young plantations. Some trees in this old orchard are upward of 30 feet high and 25 feet across, with trunks more than a foot in diameter. These trees are said to be a hundred years old (!), and as they show no indications of having been grafted in recent years, it would appear that the variety is older than claimed by Mr. Moise or else that the trees are much younger than the age claimed for them. The trees in general resemble the Peach plum. The foliage is large, thick, dark green, clean; the wood is bright, smooth, and reddish when young. The bark on the old trees is deeply furrowed and flaky. The crop of fruit for 1900 was very heavy, as with all fruits in this region this year. The first fruit ripened about August 12; the last on the trees was taken off August 30.

Specimens of the fresh fruit of this variety obtained at Carcassonne were sent to the Division of Pomology in August, 1900, and the description of the fruit made there is as follows:

Cœur de Bœuf.—Form, roundish; size, large, $1\frac{1}{8}$ inches by $1\frac{1}{8}$ inches; cavity, regular, of medium size and medium depth; stem, short, slender; suture, medium; surface, smooth, dark brownish red, covered with minute russet dots and a profuse bluish bloom; skin, medium thick, tenacious, slightly bitter; flesh, yellowish, translucent, meaty, and when overripe, juicy; flavor, sweet, rich; quality, good to very good; pit, oval, cling, small.

HISTORIC AND IMPORTANT KINDS.

Gloire d'Epinay.—Mr. Gorion, of Epinay, France, gives the following history of this variety:

It is an accidental seedling found at Epinay about fifty years ago, though as yet it is little known. The fruit is beautiful; in shape, round; in color, violet; of good quality. The tree is very productive; the fruit bears shipment very well, and the period of maturity is prolonged, often to six weeks.

The tree-fruit committee of the National Horticultural Society of France visited Epinay, August 30, 1898, and reported to the society as follows:

The purpose of our visit was to render an account of the fructification and vigor of the prune *Gloire d'Epinay*. It is a variety little known, though long grown at

Epinay. The fruit is roundish in form, dark blue in color, large, and very good. The wood and foliage resemble those of Monsieur, but the fruit is superior to this latter variety. The period of maturity is intermediate between that of Monsieur and Reine Claude. It is worthy of being propagated, as the quality is such that it will sell next to Reine Claude. At Mr. Gorion's we saw the first trees planted by him, which are about twelve years old and very beautiful, and which bore this year from 60 to 80 kilos (120 to 160 pounds) of beautiful colored and delicious flavored fruit.

D'Agen Améliorée.—Origin, eastern France. The tree and fruit of this variety resemble the Agen, with these exceptions, viz: The tree is more robust, foliage somewhat larger and fruit one-half larger, and maturing on the whole one week earlier.

Sannois Quetsche.—Origin, Sannois, France. Tree reputed to be vigorous, robust, and hardy. The fruit is large, oblong-oval, purplish in color, with a medium bluish bloom and covered with small brownish dots on a reddish ground color. The flesh resembles that of the Italian: in flavor it is somewhat sweeter and more juicy. It ripens in the latter part of August, and is rated as very good by the local horticultural society at its home.

Anna Spath.—Origin, southern Germany. Tree vigorous, upright grower, and in foliage and general appearance resembles Golden Drop, *Co.*, though the wood of the former is much tougher than that of the latter. The fruit is large, of very dark color, and considered by the Germans to be of most excellent quality. In form it is roundish, with a mere semblance of a suture; short, thick stem. "It ripens about the first of September, and cures into a heavy first-class fruit of the 'quetsche' type."

KINDS TO BE FURTHER INVESTIGATED.

From the Pomological Institute at Reutlingen wood of several varieties has been secured. The only information obtained of these varieties consisted of brief general notes on their comparative quality and time of maturing. Since 1860 this institute has been collecting varieties of fruit. At present the varieties of plums in the experimental grounds number 160. Those varieties which are suitable for evaporation are tested each year by the actual evaporation of the crop. The list of varieties appended contains such as Dr. Lucas, the superintendent, felt warranted in recommending for trial as commercial varieties. The soil and climatic conditions of Reutlingen being quite similar to those existing in western Oregon and Washington, with the exception that a lower extreme of temperature is prevalent in Germany during the winter season than on the Pacific coast, it would appear that these varieties ought to flourish in this latter region. As the time in which the writer visited this locality was September 17, all the early varieties had been harvested and the Italian and German Prunes were just in their prime, with the Italian

a little in advance of the German. This condition would seem to indicate that these early varieties would ripen in the Willamette Valley in Oregon about August 25 to September 1.

The varieties, in the order of their respective periods of maturing, are as follows:

Wangenheim Frühe Zwetsche.—Good, sweet, meaty, medium to large.

Grosse Zucker-zwetsche.—Large, good flavor, dries well.

Grosse Englisch Zwetsche.—Medium quality, juicy, large.

Ungarische Muskierte Zwetsche.—Good to best, smaller than Italian. Tree prolific, vigorous, and large.

Muskettellar.—Medium, dries well, flesh odorous.

Krauter Zwetsche.—Medium, flesh firm, not so sweet as some of the above, but possessing many good qualities.

Dollaner Zwetsche.—A fine fruit, but not always bearing a full crop; in this respect resembling the Italian; of medium size, and drying well.

Hollenbrecke.—This is a plum of the Pond Seedling type which sells as a fresh fruit for very fancy prices on the large markets of southern Germany. It has been introduced more for the purpose of using the tree as a stock for better varieties, as it is reputed to be very hardy.

MISCELLANEOUS VARIETIES.

Beside the above varieties a number of others which possess one or more desirable qualities and which appear worthy of introduction for work in plant breeding have been introduced. A few of these are only strains of varieties already known to our horticulturists, but most of them are of varieties of recent introduction in France.

The following list has been arranged in the order of relative merit as nearly as it has been possible to make it with the information at hand.

Esjum Erik.	Mirabelle Grosse.
Giant. ¹	De Montfort.
Big Rose. ¹	Des Bejonniers.
Quetsche d'Letricourt.	Belle de Louvain.
Reine des Mirabelles.	Saint Catherine.
Mirabelle de Metz.	Surpasse Monsieur.
Jaune D' Agen.	Mirabelle Precoce.
Quetsche Sueree.	Mirabelle Petite.
Czar. ¹	Mirabelle Tardive.
Altesse.	Precoce de Tours.
Tardive Musque.	Victoria. ¹
De Norbet.	Reine Claude d'Althan.
Prune Violet.	Reine Claude d'Ouillins.

As these trees are introduced from different localities, it is quite likely that some varieties are under two or more names, but as slight variations are often found in the same variety in different localities it

¹ Varieties of English origin.

has been deemed best to bring all that seemed to offer any desirable qualities, even though on trial some proved to be duplicates.

Other varieties obtained from Dr. Lucas in the form of scions were the following:

REINE CLAUDES:	PRUNES:
Jerusalem Pflaume.	Frankfurter Pfirsich.
Meroldt Reine Claude.	Fürst Frühe Zwetsche.
Späte Muskateller.	Hartwiss gelbe Zwetsche.
MIRABELLES:	Italienische Zwetsche.
Gelbe Mirabelle v Nancy.	Lucas Frühe Zwetsche.
Kleine gelbe Mirabelle.	Neue Zwetsche aus Kadolsburg.
Königin d'Mirabellen.	Reutlinger Frühe Zwetsche.
PRUNES:	Rothe aprikosen Zwetsche.
Bazalicza Zwetsche.	Rothe dattel Zwetsche.
Dorett neue grosse.	Wahre Frühe Zwetsche.

CHEMICAL COMPOSITION OF PRUNES.

The following table, prepared from analyses made under the direction of Dr. H. W. Wiley, chemist, exhibits some interesting points. The laboratory numbers of the several samples analyzed refer to the following lots of fruit: No. 20830, French grown Agen; No. 20831, French grown Agen; No. 20848, Oregon grown Agen, syn. *Petite*; No. 20849, Oregon grown Italian, "steamed;" No. 20850, Oregon grown Italian, "not steamed;" No. 20851, Oregon grown Willamette.

Composition of evaporated prunes grown in France and in Oregon.

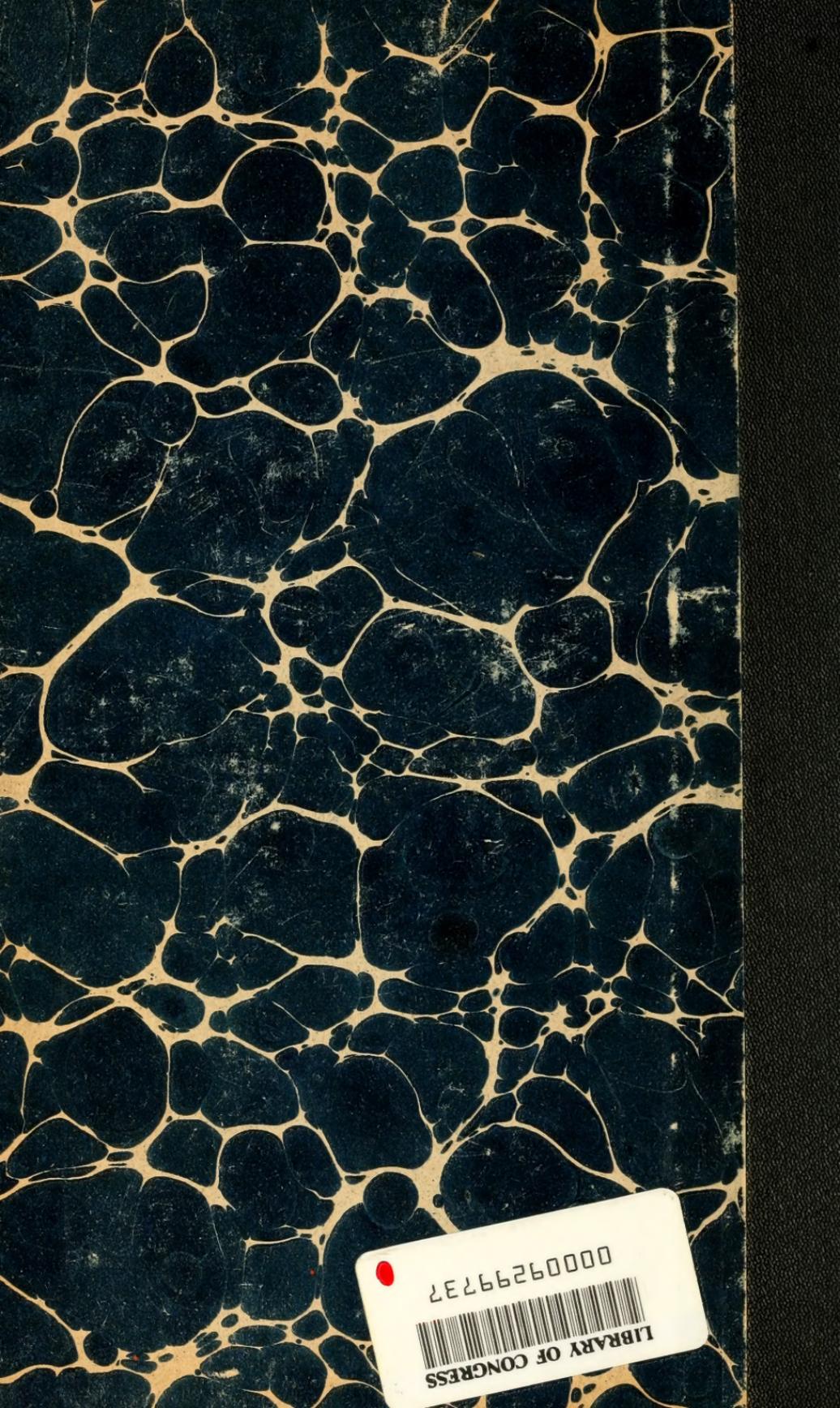
Serial No.	Number per pound.	Flesh.	Pits.	Moisture.	Ash.	Acid as H ₂ SO ₄ .	Reducing sugar.	Cane sugar.	Total sugar.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
20830	65-70	84.7	15.3	27.92	1.65	0.99	35.73	1.69	37.32
20831	50	87.8	12.2	25.14	1.75	.56	38.25	3.31	41.56
20848	128	78	22	25.78	2.35	1.51	33.28	1.87	35.15
20849	38	84.8	15.2	27.24	1.95	1.51	32.54	Not determined.	
20850	38	87.6	12.4	26.46	1.88	1.20	30.83	2.32	33.15
20851	24	88.3	11.7	25.96	2.06	1.66	34	1.18	35.18

The expressions "steamed" and "not steamed" are terms indicating the methods adopted in packing the fruit for market. The "steamed" fruit is packed hot, the other is packed in the usual manner, when cold and after having been sweated.

The samples of Italian and Willamette used in these analyses were supplied by Mr. Thomas Prince, Dundee, Oreg. The Oregon Agen sample was furnished by Messrs. Mason, Ehrman & Co., Portland, Oreg. The French Agen sample was purchased by the writer in the market place of Sainte Livrade, in southwestern France. It may be said in explanation of the Agen from Oregon that the fruit of this variety was unusually small this year, hence the large percentage of pits as compared with the Agen of France.

It will be observed from the table that though the fruit varies in size from 24's to 50's, there is only a small variation in the percentages of flesh and pits. An interesting point is observed in the sugar and acid contents. While the better lot of the Agen of France contains 41.56 per cent of sugar, they also contain 0.56 per cent of acid; yet the Agen of Oregon, while having a somewhat smaller percentage of sugar, namely 35.15, has a much larger acid content, 1.51 per cent, which is nearly three times that of the Agen of France. Between Italian and Willamette there appears to be very little difference in the essential features, though such as there is favors the Willamette, except the larger acid content. This table also shows that, so far as the fruit of 1900 is concerned, there was very little difference between the acid and sugar contents of the Agen and the Italian. In truth, the difference is so small that it would appear that the assertion generally made that the Italian is a sour prune is not founded upon fact, but rather upon belief based upon a comparison of Agen and Italian in seasons when the latter does not reach full development.





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