of good tea, we ignore entirely, and would impress on all the importance of producing a tea solely to drink and not to look at. Strange as it may seem, China green teas are valued in our markets quite as much for their appearance as for their drinking qualities.

The abandonment of all unnecessary and expensive manipulation and the deleterious system of coloring the natural products to suit the demand of uninformed purchasers, in connection with the diffusion of correct information in regard to the principles and methods of preparing the leaves for consumption, will, in our judgment, accomplish all that is required to reward your efforts to introduce, with entire success, the production of tea upon American soil.

The following extracts from a letter from Mr. M. I. Saunders, Debrugurh, Upper Assam, India, received since the preparation of the foregoing article, will doubtless prove interesting in connection with the general subject of tea-culture and tea-manufacture:

SIR: I take the liberty of addressing you on the subject of your report No. 3, on the practicability of cultivating and manufacturing tea in the United States.

* * * * * * *

I have been engaged in tea culture and its manufacture since 1864, and am at present the manager of private estates producing 125,000 pounds annually. * * * From my knowledge of the wants of the tea-plant, I conclude, after reading your report, that there should be no difficulty in successfully introducing it into many parts of the United States. * * * * * * *

The inclosed leaves show the Assam Indigenous (Pl. X, Fig. 37), the Assam Hybrid (Pl. XI, Fig. 38), and the China (Pl. XI, Fig. 39), all in a dry and unrolled state. * *

Nearly all our teas are now made by machinery. Much of the cultivation, even, is done by a machine with which one man cultivates two acres per day.

THE OLIVE.

The department desires to call the attention of agriculturists in a large portion of the United States to the importance of the cultivation of the olive, a tree of great value on account of its fruit, the uses made of the wood, and the oil which is expressed from the fruit.

Attempts, here and there, have been made to cultivate the olive in this country; but from various causes, none of which could be attributed to the conditions of the climate and soil, they were not successful to any great extent. The country was new, and farmers everywhere were not disposed to enter upon the trial of experiments with foreign plants which did not promise immediate or yearly results. The time has come, however, when agriculture is enabled to take a broader scope, and experience and observation teach a way and means to add to individual and national prosperity in the introduction of a variety of products needed by our people, suited to our climate and soil, and for which we have been dependent in the past upon other countries.

The Jesuits, it is related, introduced the olive into California more than a hundred and fifty years ago, and some of these trees are still standing and bearing fruit, though their cultivation has never been pursued in the way of a special industry. In 1755 a gentleman of Charleston, S. C., introduced the olive into that State; subsequently (1829) Mr. Robert Chisolm, of the same State, planted olive seeds, which produced trees that are still bearing. A colony of Greeks and Minorcans, who settled in Florida in 1769, brought the olive to add to the prolific plant production of that semi-tropical State. In 1817 Congress appropriated a grant of lands, in the present State of Alabama, to a company of French emigrants, for the purpose and on the condition of their introducing and cultivating the olive and the grape; but the enterprise was not successfully prosecuted, and finally failed, and the lands reverted to the government.

Thomas Jefferson, an advanced agriculturist of his day, indulged the hope of introducing the olive into Virginia and other Southern States, and when in Paris, in 1787, wrote "that although the olive was the tree the least known in America, it was the most worthy of being known," and pronounced it "of all the gifts of Heaven to man, next to the most precious;" and further adds: "Having been myself an eye-witness to the blessings which this tree sheds on the poor, I never had my wishes so kindled for the introduction of any article of new culture into our own country."

The fruit of the olive is preserved by pickling. In this form it is esteemed a great table delicacy, and in Europe constitutes an important article of food for the people.

The wood of the olive, especially the root part, is beautifully clouded and veined, has an agreeable odor, and is susceptible of the highest polish. It is greatly prized for these reasons by cabinet-makers, by whom it is wrought into their finest work. It was of this wood, so hard and lasting and of such fine grain, that the Greeks sculptured their divinities before marble and ivory came into use.

The oil, unlike most other vegetable oils which are made from the seeds of plants, is contained in the pericarp or the flesh of the fruit, and is carefully extracted from it before the seed is pressed. This is known as salad-oil. It is an inodorous, pale, greenish-yellow fluid, with a bland, oleaginous taste, unctuous to the touch, inflammable, incapable of combining with water, and nearly insoluble in alcohol. It is the lightest of all fixed oils.

In other countries this oil enters largely into the domestic economy of every family. With us it is only used as a condiment, but its essential importance is in its use in the arts and manufactures. It is also used in medicine, and is particularly valuable in the manufacture of woolens. Castile and other fine soaps are made of olive-oil mixed with alkalies. As it becomes viscid more slowly than any other vegetable oil, it is especially valuable to watch-makers, and for the workings of all complex, delicate machinery.

Italy, Spain, France, Portugal, and Austria are the countries where the olive is most extensively cultivated, and where it constitutes a large portion of the wealth of the farmer, and from whence the United States and other countries receive their principal supplies. It is cultivated also to a considerable extent in Greece, Sicily, Morocco, Tripoli, Tunis, Algiers, Turkey, and Australia.

The finest oils for table use are said to be produced in Tuscany, whence they are shipped from Leghorn in various measures, from pipes of 110 gallons to the flask of oil, with its straw covering, weighing about 14 ounces. The Apulian oil, grown in Italy and shipped from Naples, is preferred by woolen manufacturers, by whom it is extensively used. The inferior oils are used in making soap. The oils of Sicily, like those of Tunis, are too thin to be used singly in the manufacture of soap, and, being used only for mixing, are less valuable than most others.

The importations of olive-oil to the United States amount to over 400,000 gallons annually, valued at more than half a million of dollars.

The countries which grow the olive for purposes of commerce present conditions of latitude, climate, and soil similar to a number of the Southern States and a portion of the Pacific coast. It is a hardier tree than the orange, and will endure a much colder climate. It will prosper even in barren soils, and requires but little attention in its culture.

The olive, botanically speaking *Olea Europæa*, was one of the plants brought into cultivation at a very early period of man's history, and con

siderable doubt now exists as to its native country. Some authors suppose it to have originally belonged to Western Asia, from whence it migrated into Southern Europe and Northern Africa, while others regard it as indigenous to both Europe and Asia. The tree seldom exceeds 20 feet in height, and has oblong or lance-shaped leaves, smooth upon the upper surface but hoary underneath, axillary, erect racemes of flowers, and pendulous ellipsoidal fruit. The fruit is a smooth, oval plum, about three-fourths of an inch in length and one-half inch in diameter, of a deep violet color when ripe, whitish and fleshy within, bitter and nauseous, but replete with a bland oil, covering an oblong, pointed, rough nut.

It is a branching, evergreen tree, of slow growth, very tenacious of life, and of great longevity; so great, indeed, that it is thought probable that the trees at present existing in the vale of Gethsemane are those which existed at the commencement of the Christian era.

In all ages the olive-tree has been held in high estimation. It is written that in early times a branch of it, borne to the Ark by the returning dove, signified to Noah that the waters on the face of the earth were subsiding. Among the Greeks and Romans wreaths of its leaves adorned the brows of conquerors, and it has ever been regarded as the symbol of peace. The value and usefulness of the olive, the little attention necessary to its culture, and the waste situations which it renders productive, should make it an object of special attention in a large portion of the United States.

In the East, where the olive is cultivated with success, the mean temperature of the year is between 58° and 66°; the temperature of the winter not being under 42° nor that of summer below 71°.

Its cultivation in Europe, however, where the olive enters largely into the industries of the people, and where it is found in perfection, extends as far north as latitude 44½°, showing that it endures considerable vicissitudes of cold and heat, and that in this country it could be cultivated successfully from latitude 35° north down to the Gulf of Mexico, embracing an area of ten or a dozen States.

Mr. P. L. Simmonds, an English author of several valuable works on agriculture, has furnished, perhaps, the most thorough information on the culture, &c., of the principal products of the vegetable kingdom. In the course of an exhaustive treatise on the subject of the olive, he states that in France and Italy the young olive bears fruit at two years old, that is, in two years after it has been placed in the plantation. In six years it begins to repay the expense of cultivation. After that period its products are the surest source of wealth to the farmer.

Soil which consists largely of lime is very favorable to the growth of the olive-tree. Situations near the sea are also favorable to it. The islands on the coast of Georgia and Florida, and the seaboard of North and South Carolina, are well suited to its cultivation. One of the great merits of the olive-tree, however, is that it will grow in almost any situation where there is not a redundancy of moisture, and in any kind of soil in a latitude congenial to it.

The olive-tree is propagated by sowing the seeds, from cuttings and graftings which grow easily and readily, and from little swellings or knobs called *uovoli*, which are excrescences upon the bark containing embryo buds. *Uovoli* is a Tuscan word, and means little eggs. These are similar to bulbs, because they are capable of producing new plants. They are carefully separated from the trunk and planted in the ground where it is intended they should remain. The tree is not very productive until it is six years old, when it produces valuable crops. From this period it yields very abundantly for many years, even until a great age

after the trunk has become hollow. In the south of France, and in Italy, there are olive groves which are said to be 700 years old, and which are still productive.

In making a plantation the plants should be set out in rows, about the same distance apart as are the trees in an apple orchard.

Like most other trees that have been cultivated for a length of time, the olive has produced numerous varieties, different countries and even different districts cultivating their peculiar favorites. The variety known as *longifolia* (long leaf) and its many varieties are chiefly cultivated in France, Italy, and Austria. The variety *latifolia* (broad leaf) and its subvarieties are those chiefly cultivated in Spain. By distinct names there are five kinds whose cultivation receives particular attention, viz., *Verdall*, which yields fine oil and makes a good conserve; *Blanquet*, with a particularly sweet and delicate oil (these two have low-growing branches, which enable them to be picked by hand); *Bouquettier*, a very superior oil; *Redouanou*, which stands cold well; *Olivier de Grasse* yields excellent oil, but grows high, and is not so well adapted to picking.

The olives of the above-named varieties are propagated in various ways. Cuttings of 9 inches in length, taken from one-year-old shoots, may be planted in a rich light soil and kept moderately moistened. The ground ought never to be allowed to become very dry. Under such conditions the cuttings will root freely in a few weeks, and be fit for transplanting in twelve months. They are propagated also from seed. In Italy propagation is conducted in the same manner in which it was during the time of the Romans; that is, from little swellings or knobs called *uovoli*, heretofore described.

In Spain the olive forms a very considerable product of its agriculture, and large tracts of land are planted in olive groves.

The harvest of the olive begins when they are scarcely ripe. The green olives are put in a solution of salt, where they are kept for some time to cause them to lose their natural bitter taste. They are then carefully preserved in vinegar, mixed with different spices, and sold in bottles or small barrels. In all parts of Southern Europe they are, in this form, a daily food.

The treatment of the ripe olive is more important. They are gathered in the fall, when they are as large as common plums. Their color is then a dark green, and the kernel has changed into a hard stone, which contains a savory almond. The flesh is spongy, and its little cells are filled with mild oil, which pours out at the least pressure.

The proper season for gathering the olives for the press is the eve of their maturity, which varies in different climates and in different varieties, but which is easily distinguished by the color of the fruit. The quantity of the oil, it may be mentioned, depends upon gathering the fruit in the first stage of its maturity. If possible the harvest should be completed in a day.

The best manner of collecting the fruit is by hand, though there are two other modes. One is by shaking and the other by beating the tree with slender poles, but both are injurious. The shaking harms the roots and the beating breaks the young shoots and branches.

The olive-tree, in full bearing, yields on an average from two to three bushels of fruit, which would produce from fifteen to twenty pounds of oil. Properly planted, an acre of land should contain about one hundred olive trees. Grasses and other crops may be cultivated between the trees to advantage, and it is a good plan to fold sheep in the olive orchard. Olive-oil may be said to form the cream and butter of those countries in which it is pressed. There is a common saying in Italy that

"If you want to leave a lasting inheritance to your children's children, plant an olive."

A simple method of pickling olives while green and in a full-grown state, as practiced in France and othes countries, is as follows: For each pound of olives take a pound of good strong ashes (those from hickory wood are the best) and an ounce of good slaked lime; mix the lime and ashes with water until a soft mortar is formed, into which stir or imbed the olives, and finish by covering the whole mass with a layer of dry ashes. Let them remain in this state until all the bitumen is extracted, which may be known by the stones slipping readily out of the pulp when squeezed between the forefinger and thumb, for which purpose a few may be tried once an hour or oftener if desired. The length of time required for this, however, will depend entirely upon the quality of the ashes and lime, and may consequently vary from two or three hours to a day or two. As soon as the olives have been deprived of their bitter ness, they must be cleanly washed and put to soak in fresh water, which must be changed about once an hour for twenty-four hours, when the taste of potash will be removed and the water ceases to be discolored. The olives must then be put into bottles or jars, and a strong brine put over them made from good rock or alum salt. This brine will generally require to be changed several times in consequence of becoming ash-colored; after which the bottle must be sealed air-tight, and if kept in a cool, dry, dark place the olives will keep for years. Olives carefully prepared after this plan will be found very palatable and delicate, and will retain much of the nutty flavor of pure olive oil. In their preparation coriander, cloves, cinnamon, and such aromatics as are desired may be added to the brine.

Such of the prepared or pickled olives as are destined for the tables of the luxurious are taken out of the brine after a certain time, deprived of the stones, in place of which is substituted a caper, anchovy, or a bit of truffle, and closed up in bottles of the finest oil. In this manner they are kept palatable for two or three years.

In some countries, to give the prepared olive a deeper green color, an admixture of copper is used; therefore those of a fawn color should always be preferred in the selection.

The oil is obtained by a simple process. The freshly-gathered olives (the ripe fruit) are put into little heaps, and by their own weight the oil is pressed out and is caught in some vessel placed to receive it. The pulp of the fully ripe fruit contains a very large per cent. of oil. When the fruit ceases to give the oil in this way, by themselves, they are crushed in a mill of very simple construction, when the workmen remove the pulp, put it into coarse sacks, and subject it to a very gentle pressure.

The first oil extracted and used for culinary purposes is of the purest quality, and is called virgin salad-oil. The pulp is next thrown into boiling water from the surface of which the oil is skimmed. Even after this second process a certain quantity is left in the refuse. Being of an inferior sort it is used only in making the coarser soaps, plasters, &c. There is still another quality of oil obtained by moistening this residuum, breaking the stones, then boiling and again pressing it. This is used for burning purposes, in lamps, &c. Of the refuse, at last, formed into cakes by the pressure in extracting the oil, a good fuel is made, which burns steadily and gives a good light. From the ashes of this a potash is made. After the oil has been drawn it deposits a white, fibrous, and albuminous matter, but when this deposition has taken place it undergoes no further alteration, and is ready for bottling. The utmost cleanliness is necessary in making the oil. With the nicest economy in the

process, which is finished in a day, it amounts in weight to nearly one-third of the fruit. The mean produce of the tree may be assumed in France at ten pounds, and in Italy at fifteen, but single trees have been known, in a good season, to yield eight or ten times that quantity.

The oil-mill retains nearly its primitive form, and consists of a basin raised two feet from the ground, with an upright beam in the middle, around which a massive millstone is turned by water or by a beast of burden. The press is solidly constructed of wood or of cast-iron, and is moved by a compound lever.

Gallipoli, in Italy, supplies large quantities of oil to foreign countries, and is celebrated for its fine purified oils. It is clarified to the highest degree by keeping it in cisterns hollowed out of the rock on which the town is built. When shipped, it is put into well-constructed casks, the staves of which, before they are put together, are well soaked in sea-water. In this condition it will perform long voyages in the heat of the summer, without waste or leakage.

The olives of which the Gallipoli oil is made are never gathered from the trees, but allowed to drop in their maturity on the ground, where they are picked up, chiefly by women and children, and carried to the mill.

Aix, in France, is also celebrated for its olive groves and the manufacture of superior qualities of oil.

Olive oils are classed into table or edible oil, refined oil, manufacturing oil, and burning oil. The first or salad oil is divided into fine, superfine, and ordinary.

The Italians keep their oil in stone jars. The oil for sale is filled into barrels made of oak staves imported from Germany.

The treatment of oil resembles somewhat that of wine. By a long rest dregs will settle at the bottom, which must be removed or the oil would become rancid, therefore the barrels are tapped every six months and filled anew. Oils of a finer quality can seldom be left more than three years.

The process of refining oil is as follows: Large shallow tin boxes are made with small holes pierced in the bottom, which is then covered with a thin sheet of wadding. Four, five, or more of these boxes are placed on frames, one over the other, and the oil, being poured into the top box, is allowed to soak through the wadding and drop into the next box, and so on until it gets into the last, when it runs off into the tanks. The wadding retains all the thick particles contained in the oil when it comes from the mill, and leaves it perfectly clear.

Mr. Robert Chisolm, of Charleston, S. C., writing under recent date in regard to his experience in the cultivation of the olive, says:

I procured my trees from the neighborhood of Florence, Italy, through the American consul there, with whom I was acquainted, while I was traveling in 1828 and 1829. I received two varieties, one for stocks and the other for scions, to bear the fruit for oil-making. Both varieties bear, and equally abundantly in my soil, but the variety sent for stocks bore fruit which, although larger than that borne by the variety for making oil, yet it was inferior in quality, and did not even make as good pickled olives, but as I did not know the difference between them, both were propagated equally as long as I continued to increase my trees, which I did until I had between 250 and 500 trees, many of which are still alive and growing, and well, as well as could reasonably be expected from the repeated burnings of the land by the negroes just after the war, when they took possession, and since my return the little attention that I could give them. Before the war it was my practice to manure the grove every spring and plant it either in sweet-potato slips (layers of the vine), or "cow" or "clay" pease, and then the trees bore most abundantly and regularly every year, almost to the breaking down of large branches. The normal habit of the olive tree, like that of most other fruit trees under ordinary treatment, neglect to bear a full crop one year, and the next year rest and recruit. The soil of my plantation was a rather stiff clay loam, in

which pears throve admirably and bore only too well, while peaches, grapes, and apples did not thrive. Some years ago I made a little oil and exhibited it at the fair of the South Carolina Institute, and was awarded a premium for it, but as the gathering of the olives had to be done just at the most busy season of a planter's year, I never gathered any crop. I was a large cotton-planter and such a small business would not pay, as labor was limited and needed for more profitable employment. However, I always gathered enough to pickle for family use and to make presents to my friends.

The following is the recipe by which I have always pickled my olives, and for which I have received several premiums (the same as found elsewhere in this paper, derived from Mr. Chisolm).

The main reason why I never made my olive crop into oil was that I could not, in this country, get bags that could stand the pressure necessary to extract the oil. Canvas could not stand, neither Dundee bagging, as I tried both and failed.

In Europe bags or sacks called "cabas d'esparlerie," as I read, are the only ones that are used, and I never could procure any in this country.

I had a cotton-seed-hulling machine and a powerful press, but being unable to procure the necessary bags to stand the pressure, could do nothing.

Olives are eaten greedily by cattle, sheep, hogs, and poultry, and for feeding any of the above stock it would pay handsomely to cultivate the trees. Poultry proved to be very fond of the olives while steeping for pickling, and for several winters I kept a small stock of hogs in fine order upon the ripe olives daily shaken down for them, and yet they are, when ripe, about as bitter as quinine.

I have cultivated successfully the Capers plant (*Capparis spinora*), making annually four bottles to each plant, with no more trouble than gathering the buds and dropping them in a bottle of vinegar at hand. The plant endures our climate perfectly, with the precaution of covering each plant in the autumn with a bushel (more or less) of long manure.

The truffles can be cultivated in this country, and could hardly fail to prove a very lucrative small industry, as it is suited to very poor, sandy lands, and only requires the cultivation of a certain variety of the oak (the *Quercus pubes*) for its production. The truffles are worth $4 per pound in the markets of Paris.

Mr. Frank A. Kimball, of California, in writing of the cultivation of the olive in that State, says:

That this tree is wonderfully productive for one so long lived is evidenced by the fact that Mr. Thomas Davis gathered 192 gallons of fruit from one tree, which netted him over $150 (in 1873, at Mission San Diego). This orchard is now under control of the Catholic Mission, and is entirely uncared for. In the spring of 1872 I procured some limbs from this orchard and cut them into pieces about 12 inches long, and on the 9th of May set them out. In the fall of 1876 I picked five gallons of olives from one of the trees, and in 1877 I gathered about 12 gallons from the same tree, the row of eleven trees averaging about six gallons each, which would bring $1 per gallon to-day at wholesale. In April of 1875 I bought cuttings for five acres, and set them out during that and the following month. None of them started till August. (The cuttings were taken from the trees in January and lay exposed till April.) The following February one of the trees bloomed, and in October, fourteen months from the time the first leaf put out, I gathered one ripe olive. The succeeding February it bloomed, and in October last some of the fruit was ripe and still ungathered. Over fifty of the trees bloomed, but I allowed only two to bear fruit. I have cultivated these trees as follows: Cuttings were watered four times the first year, six gallons per tree each time; next season four times, with quantity increased to ten gallons; and in the past season four times, increasing the quantity to about fifteen gallons. After each watering I stir the ground around the trees, usually with a garden rake. My trees, some twenty-five acres, are set out at an average distance of 24 feet each way. I hope to add twenty acres this year, believing, as I do, that at three years old they will pay an income, and at five years old will produce from three to five hundred gallons of fruit per acre. The wholesale price of San Diego olives has never been less than 80 cents per gallon. Our market is the world.

Mr. H. S. Kedney, Maitland, Orange County, Florida, writes:

The olive grows as luxuriantly in Florida as in its native lands. There are groves of immense olive trees in portions of this State which are annually loaded with fruit. This fruit is of the poorest variety of the olive, as I know, having paid particular attention to the olives grown near Oporto, in Spain.

Orange County, from its altitude, as compared with most other counties of the State, is particularly suited to the growth of the olive. The only objection to their culture is the time required to bring the fruit to perfection, but the dwarf olives of Oporto commence to bear in three or four years from the scion, and produce large fruit of superior quality.