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DEPARTMENT OF AGRICULTURE.
SPECIAL REPORT—No. 18.

TEA-CULTURE AS A PROBABLE AMERICAN INDUSTRY.

BY

WILLIAM SAUNDERS,

SUPERINTENDENT OF GARDENS AND GROUNDS, DEPARTMENT
OF AGRICULTURE.

READ BEFORE

THE NEW YORK HORTICULTURAL SOCIETY,

AT

ITS MEETING IN NEW YORK CITY OCTOBER 7, 1879.



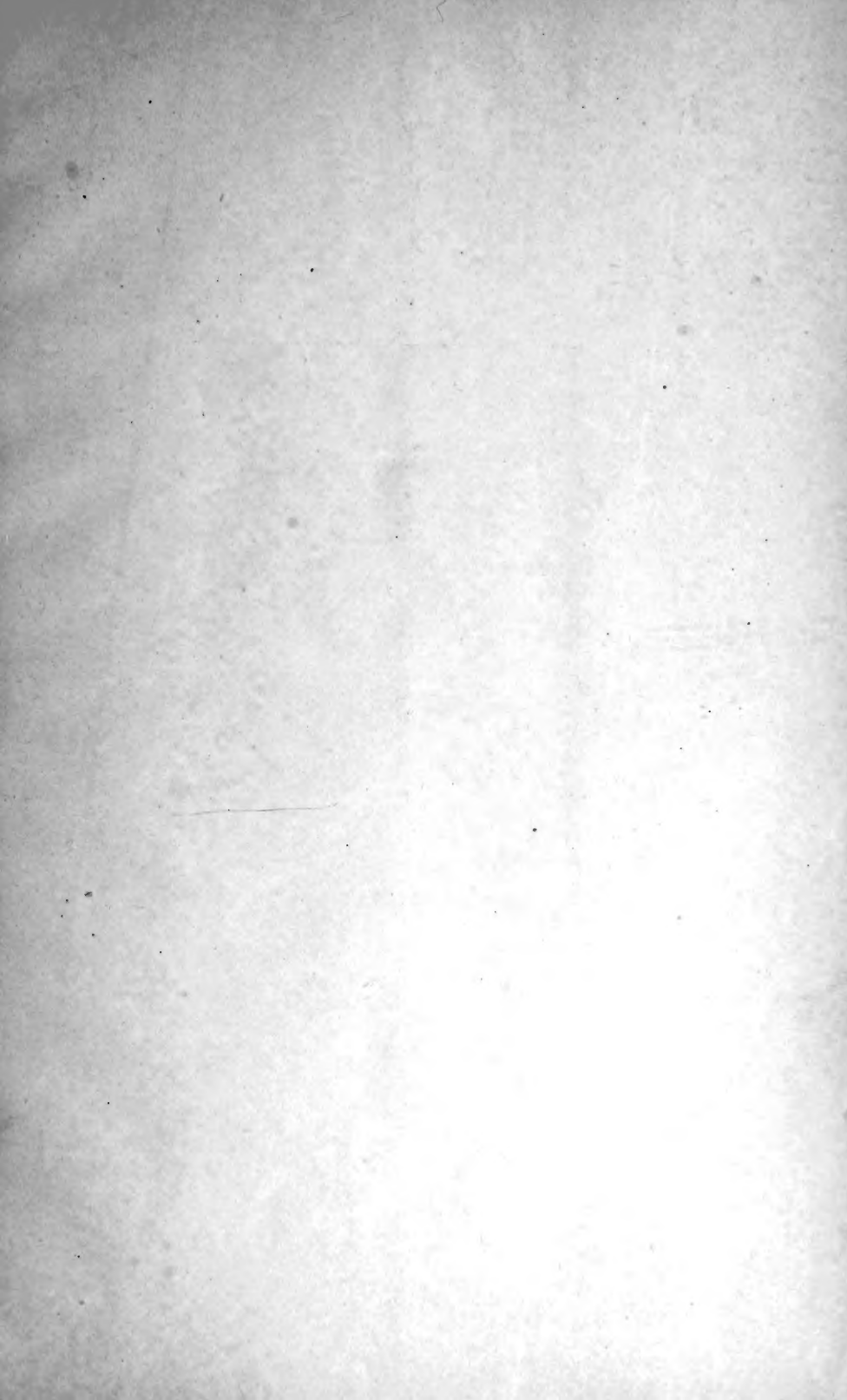
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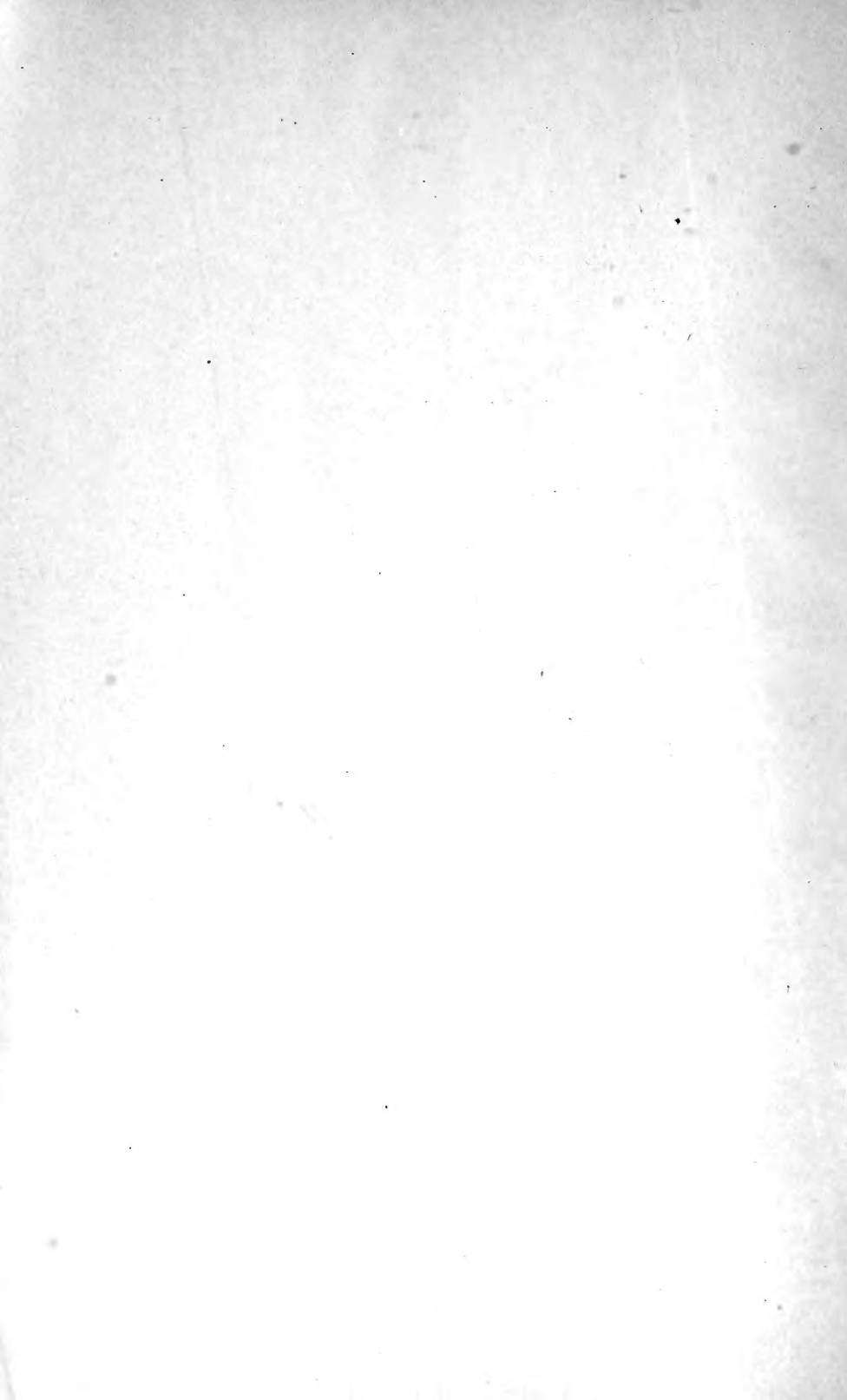




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TEA-CULTURE AS A PROBABLE AMERICAN INDUSTRY.

Tea has been used by the Chinese from remote antiquity. It is related that it was in general use in China about the year 600, and that it was introduced into Japan early in the ninth century.

The first introduction of tea into Europe is claimed for the Portuguese, who, about 1577, commenced a regular trade with China. In 1664 the East India Company had about 2 pounds of tea sent to England as a present to the King, which would indicate that the article was considered a rarity. It had, however, been introduced into England previous to this, for, in a newspaper in the British Museum, dated November 23, 1651, is found the following advertisement: "That Excellent, and by all Physitians approved, China Drink, called by Chineans Tcha, by other nations Tay, alias Tee, is sold at the Sultanness Head, a Cophee-house in Sweetings Rents, by the Royal Exchange Londón." Pepys also mentions in his diary, under date September 25, 1660: "I did send for a cup of tea, a China drink, of which I had never drank before." Again, in 1667, he further alludes to it, and by this time he had introduced the herb into his own house, for we find the entry thus: "Home, and there find my wife making of Tea, a drink which Mr. Pelling, the potticary tells her is good for her cold."

For nearly twelve centuries the world's supply of tea was furnished by China and Japan.

The tea-plant, *Thea viridis*, is a native of Asia, but it has not been found in a really wild state except in Upper Assam. Although the vast Empire of China has not been so thoroughly explored by botanists as to warrant the assertion that it is not growing wild in some portion of that country, yet it has not been found there except in a cultivated state, or as having evidently escaped from cultivation in stray plants found on roadsides and waste places.

As far as ascertained, the first announcement of the tea-plant being indigenous in Assam was made in 1823; but owing to imperfect specimens of the shrub having been forwarded to botanists, it was not considered to be a true species of tea. This was not fully demonstrated until 1835, when the plant, with perfect flowers and seeds, was obtained, which proved it to be a genuine tea, very closely allied to, if not identical with, the tea of China, the exclusive source of all the varieties and shades of the teas of commerce.

The discovery of the tea-plant in Assam led to the supposition that its culture and manufacture could be made a profitable industry in that country. Consequently, in 1839, a joint-stock company with a large

capital was formed in London for bringing the tea-forests of Assam, as they were called, into cultivation. In 1840 they commenced operations on a very extensive scale; extravagant expenses were incurred under the idea that the profits of tea-culture would be so great as to render any attempts at economy altogether unnecessary.

This company, having by reckless management thrown away one million of dollars, was brought to the verge of bankruptcy. Better counsel and more economical management having prevailed, the success of the enterprise was subsequently established. The teas manufactured from the Assam plant were at first rejected by the London brokers, but more care having been given to the manipulation of the leaf, and to other processes of manufacture, the product brought higher prices than the finest Chinese teas. This gave an impulse to the new industry in Assam, which soon spread to the Himalaya slopes and to other parts of British India.

The unfavorable reports made upon the earlier samples of Assam teas suggested the propriety of introducing the Chinese plant; accordingly tons of seed were secured and large plantations were formed with the plants raised from these importations. Thousands of plants were also shipped from China for the same purpose, all of which is now much regretted, as the true Assam plant is said to furnish a better class of teas; the plant is also more prolific and amenable to culture than are the plants from Chinese varieties.

Botanists who consider that the Assam tea is a distinct species have given it the name of *Thea Assamica*, to distinguish it from the *Thea viridis*, the Chinese species. There are others, however, that recognize only one species, and hold that the Assam plant is the wild type of the Asiatic tea, and that all the plants under cultivation are but varieties caused by climate, soil, and special culture.

Planters distinguish many points of difference between the Chinese and the Assam plant. The Assam grows much quicker than the Chinese plant; this renders it more profitable, as it affords a greater number of pickings during the growing season. When full grown the leaf measures 9 inches or more in length. The leaf of the China plant seldom exceeds 4 inches in length. The Chinese plant is much hardier and will succeed at higher elevations than the Assam; it is also more prone to produce seed, which is injurious to its value as a leaf-producer. The leaf of the Assam plant does not harden so quickly during growth as that of the China, which is an important consideration in picking the leaves, and, finally, the teas made from it are superior to the Chinese.

It is said that most of the Indian plantations are composed of crosses between the Chinese and the Assam plants, so that no plantation is wholly made up of the indigenous kinds, but it is conceded that the nearer each plant approaches to the indigenous, the higher is its excellence, and that it would have been better had China seed never been introduced into the locality.

The Indian tea now sells from 12 to 25 cents per pound higher than the Chinese. The imports of Indian tea into Great Britain for the year 1877 was 31,882,000 pounds.

I have introduced so much concerning the Indian operations, because it is to India that we must look for examples to be followed in our efforts here, rather than to China or Japan, as will be further noticed.

With regard to the introduction of the tea-plant into the United States, the earliest notice which has come under my observation is contained in the following extract taken from the *Southern Agriculturist*, published in 1828:

I find that the tea-tree grows perfectly well in the open air near Charleston, where it has been raised for the last fifteen years at M. Noisette's nursery. Tea, as exported from China, would cost too much in the preparation, for each leaf goes through a particular process there. But, as this is probably done with a view of economizing room and preserving its freshness in the long sea voyage to which it is exposed, we might, in raising it as a crop, use it and export it, at least northwardly, dried in the same manner as senna or hops.

This suggestion about drying the leaves for transportation has recently been revived. It is not improbable that the dried leaves, pressed in cakes, may become an article of interior commerce, and be subjected to the roasting process like coffee just previous to use, a method which would increase the aroma, if found practicable in ordinary domestic practice.

Another historical effort to introduce tea-culture into this country was made about 1848, by Junius Smith, at Greenville, S. C. Although commenced with some degree of enthusiasm the plantation never was increased to any extent, neither was it ever brought to a condition, as far as can be ascertained, to warrant the formation of any reliable opinion as to the practicability of the culture of tea; nevertheless, the circumstance of the failure is often quoted as a proof that tea cannot be grown profitably in this country. It is safe to say that as a test of tea culture the effort was of no value whatever, and never was so considered by those conversant with its management.

During the year 1858 the United States Government, through the Commissioner of Patents, ordered and received about 10,000 tea-plants from China. These were transported in Wardian cases, the cases being filled with soil, in which the seeds were sown just previous to shipment. These vegetated during the voyage, and the plants averaged 18 inches in height when taken out of the cases in Washington.

These plants were immediately placed under propagation, and in a short time the stock was increased to 30,000 plants, which were distributed throughout the Southern States. The propagation and dissemination of tea-plants formed a prominent feature in the operations of the Agricultural Division of the Patent Office until the commencement of the war, which put a stop to such communications for several years.

The Department of Agriculture was organized during the year 1862.

For some time after its establishment but little attention was given to the propagation of the tea-plant; still, it was at no time entirely abandoned. It was fully understood that, so far as the growth of the plant was concerned, it could be successfully cultivated over a large extent of country; but, sharing in the belief that the amount of manual labor required in the manipulation and preparation of the leaf (as practiced in the oldest tea-growing countries, and which was considered to be indispensable) was so great as to preclude the idea that we could compete with the low-waged Asiatics, no special efforts were made to disseminate the plants, or to increase them further than to supply such applicants as desired to make experimental tests.

Meanwhile the progress of tea-culture in British India was watched with interest; the successful results of improved methods of manufacture, and the introduction of the various labor-saving processes which were being made from time to time by the planters in that country, suggested the probability that the production of tea might be made a profitable industry in some portions of this country where labor-saving appliances usually followed closely upon the knowledge of their necessity.

Consequently fresh supplies of seed were imported from Japan, which resulted in enabling the Department to disseminate many thousands of plants. These efforts were materially enhanced when, about 1867, it was found that an abundance of tea-seeds could be procured in some of the Southern States from the plants which had been distributed from the importation of 1858.

For several years after 1868 the Department distributed annually from 5,000 to 10,000 plants, reaching in 1876 to over 20,000 plants. By this means it was expected to popularize the culture of tea as a domestic product, with the hope that public interest would in time be directed to its cultivation as an article of commercial value.

Encouraged by reports of successful culture, which were in many instances supplemented by samples of manufactured tea of undoubtedly good quality, more decided and energetic efforts were made towards establishing this industry, and during the past two years more than 100,000 tea-plants have been distributed, and the Department has under preparation at the present time at least 120,000 plants which will soon be ready for dissemination in localities where they are most likely to succeed.

The cultivation of the tea-plant is as simple as that of a currant or gooseberry, and when cultivated for its leaves it soon assumes the appearance of a low-spreading bush; although, if left to its natural proclivities, it reaches the size of a slender tree from 15 to 20 feet in height.

Tea-plantations are established in a similar manner to those of other economic plants. The uncertain method of trying to secure a uniform plantation by dropping the seeds at the spots in the field where the plants are to be permanently located is sometimes adopted, but the

most satisfactory mode of establishing a plantation is to sow the seeds in nursery rows, and when the plants are of sufficient size they are removed and planted in their permanent sites. They will reach to a height of 8 to 12 inches in one year, and are then strong enough to bear transplanting. It may be mentioned that the seeds require to be covered with about one inch of soil, and shaded from the sun. This is absolutely necessary, otherwise the young points of the plants shrivel up as soon as they emerge from the soil. After various attempts we find that a covering of short hay spread rather thickly over the seed-bed is the best protection; the young plants gradually push through this covering as they grow.

The best soil for tea is a deep rich loam, such as is found in our best garden soils. I am convinced that the soil cannot well be too rich for profitable culture of tea, provided it is properly underdrained. Any attempts to grow it on poor soils will result in absolute failure, so far as profit is concerned.

The plants are usually placed in rows which are 4 to 5 feet apart, the same distances being allowed between the plants in the rows. For convenience of culture I would prefer placing the rows 6 feet apart, and the plants 4 feet from each other in the rows. For the first two or three years some crop, such as potatoes, may be planted between the rows, and probably higher growing crops, such as corn or cotton, might be grown, the shade and shelter thus obtained being favorable to the growth of the young tea-plants.

Even under the most favorable conditions for growth no leaves should be gathered until the fourth year from planting. Picking the leaves for tea has a tendency to weaken the plants, hence they should be robust, healthy, and well established before picking commences. Much of success in the management of a plantation depends upon the discrimination used in picking lightly from weak plants, or in passing them altogether for a season, thus enabling them to acquire additional strength.

The pruning of the tea-plant is also of some importance. During the period of preparatory growth, that is, during the first five years, an annual inspection should be given the plants in early winter for the purpose of cutting back all strong shoots that seem to impair the shape of the plant, the object being to secure a bushy, much-branching habit, which is favorable to producing the greatest quantity of the most desirable kind of leaves.

Whenever a plant becomes weakened by the periodical removal of leaves, it can be restored to vigor by thinning out many of the branches, and cutting the whole of them quite close down during winter. This will be followed by a more vigorous growth the following summer, which should not be checked by picking any of the leaves, or otherwise retarding the growth during the season, thus increasing the root-growth for future extension of shoots and leaves.

When the plants have gained a proper size to furnish a crop, and the

young shoots have expanded a sufficient quantity of leaves, the leaf-pickers commence work; an operation which is thus described:

Each individual has a basket slung at the back, and with both hands speedily strips the shoots of the leaves required, taking care not to injure the auxiliary buds, as they have to yield the next crop. The leaves, as collected, are thrown over the shoulder into the basket. A good picker will sometimes collect 50 pounds of green leaves in a long day's work, but the average is about one-half of this. Four pounds of green leaves make about one pound of manufactured tea. The earliest spring pickings make the best teas. These yield the famous Young Hyson. At this period the leaf is very thin, having a large proportion of juices as compared with the solid matter, and is dried of a greenish color, retaining a most delicate flavor. This grade of tea seldom reaches distant markets, as it speedily ferments if put up in masses for ordinary shipment, and can only be conveyed in small quantities by land routes. This superior article may be said to be unknown in this country, and it is one of the luxuries in store for us when tea-culture becomes one of our industries.

After this first gathering the plants will soon again be covered with young leaves, especially if moist weather prevails. A rainy season at this period is of the greatest value, and in its absence irrigation may be introduced with the best results. Copious rain-falls during May and June insure an abundant crop, and characterize a climate well adapted for the culture of tea. The pickings continue more or less during the season of growth; they are influenced by rain-fall, condition of soil, and heat. A rich soil, where the rain-fall is copious, will further the growths so as to afford from 16 to 20 pickings during the season. Sometimes the conditions will be such as not to produce the half of this.

With regard to climatic essentials, the tea-plant will withstand a zero cold without material injury, but it is most profitable in climates where the thermometer seldom shows more than 6 or 8 degrees below the freezing point. Teas are made in much cooler climates, but the growing season is too short for producing many profitable pickings. But by far the most important climatic condition is the amount of rain-fall. A dry climate is altogether unfit for tea-culture. A hot, damp climate is best. The rain-fall in the most profitable tea-districts of India is from 80 to 100 inches per annum, and the more of this that falls in the spring months the better. It is doubtful whether tea can be profitably grown in this country in any district where the rain-fall is below 60 inches per annum; and that, too, must be pretty equally diffused over the spring and summer months. Where irrigation can be systematically introduced, the rain-fall is of less importance.

The manufacture of tea as at present conducted is a very particular operation. Much of supposed value of the article depends upon the uniform accuracy with which the various processes are conducted. It is said that the value of teas is fixed after they are delivered to the

brokers, and that the character of the article from the same plantation is far from being uniform from year to year. This is more particularly the case with the Chinese teas, and is largely attributed to the routine nature of the methods employed, as contrasted with specific and exact systems.

The planters in India soon discovered that they could not profitably follow the various minute processes and details practiced by the Chinese, and they set themselves to study the philosophy of the whole subject of the preparation of the tea-leaf for market. The result has been that many operations which were formerly considered necessary have been much reduced. Instead of following a Chinese method which involved twelve operations occupying three days, the best teas in India are made by five operations which are completed in two days.



The method of picking the leaves and the routine of manufacture as practiced in India, is described as follows:

Referring to the diagram which represents a young shoot, the grades of tea manufactured from the different aged leaves are thus named: *a*, Flowery Pekoe; *b*, Orange Pekoe; *c*, Pekoe; *d*, Souchong 1st; *e*, Souchong 2d; *f*, Congou. Mixed together, *a, b, c*, Pekoe; *a, b, c, d, e*, Pekoe Souchong.

If there be another leaf below *f*, and it be taken, it would be Bohea. Fine tea can be made of the young succulent leaves only. The younger

and more succulent the leaf the better tea it makes. Thus *a* will make more valuable tea than *b*, *b* than *c*, and so on; *e* is the lowest leaf to make tea from, for, though a very coarse kind can be made from *f*, it does not pay to take it. The stalk also makes good tea, as far as it is really succulent, that is, down to the black line just above the figure 2.

The value of tea is increased when it shows Pekoe tips. Only the leaves *a*, *b*, make these. They are covered with a fine silky whitish down, and if manufactured in a particular way make literally white or very pale yellow tea, which, mixed with ordinary black tea, show as Pekoe tips. In ordinary leaf-picking these two leaves are taken with the others, but when manufactured with them they lose this white or pale yellow color and come out as black as the rest.

The operations of tea-manufacture are classified in the following sequence:

1st. Withering the leaf; 2d, rolling; 3d, fermenting; 4th, sunning; 5th, firing.

Now, to make the best quality of tea, each one of these processes is carried to a certain point and no further. Unwithered or underwithered leaves break in the rolling, and give out large quantities of a light green-colored juice during the process. The tea is much broken, and of a reddish gray color. The liquor is very pale in color, weak, soft, and tasteless. Overwithered leaf, on the other hand, takes a good twist in the rolling, gives out but little juice, which is of a thick kind, and of reddish color. The tea is well twisted and blacker than ordinary; the liquor of an ordinary depth of color, but with a mawkish taste.

There are several tests to show when leaf is withered. Fresh leaf squeezed in the hand, held near the ear, crackles, but no sound should be heard from withered leaf. Withered leaf pressed in the palm of the hand retains the shape into which it has been pressed. The stalk of withered leaf will bend double without breaking. Properly withered leaves are like old rags to lay hold of, and no further test, after experience, than the feel of the leaf is necessary.

The rolling of the leaves is for the purpose of twisting them, and also for the removal of a portion of the juice. This, however, is said to detract from the value of the tea, and one of the reasons why India tea is stronger than Chinese tea, is that in India the sap or juice is generally retained, while in China it is allowed to run off. The rolling is partly done by machinery, but finished by hand; but even when done solely by hand, an expert can finish 30 pounds in one day. Hard rolling gives darker colored and stronger liquor than light rolling. Hard rolling destroys Tekoe tips, inasmuch as the juice expressed stains them black. These tips are the small unopened leaves which, when not stained, are seen in Pekoe tea as whitish or orange-colored particles or ends. Light-rolled tea has more of these tips than hard-rolled, but hard-rolled tea is blacker and better, with the exception that the color of the Peko tip is lost.

When the rolling is finished the tea is left in rounded balls, which are allowed to remain for a time to ferment. The time allowed for fermentation is only learned by experience. There is no time to be fixed for the fermenting period. It is quicker in warm than in cool weather. The fermentation is stopped by breaking up the ball and spreading out the leaves very thin.

It is then spread out on mats exposed to the sun. This is termed the sunning process. It is turned over, so that the whole of it may be affected by the sun. With bright sunshine, about one hour's exposure is sufficient. It is then ready for the final process of firing.

Until lately it was considered essential that the heat for the final drying or firing the tea should be derived from burning charcoal. It was asserted that the fumes of charcoal were necessary to make good tea, but it is now settled that the only effect of heat is to drive all the moisture out of the roll, and heat from any source serves the purpose.

The firing is done by furnaces, which are heated by any kind of fuel, and it is claimed that it has many advantages over the old charcoal method. It is more economical, cleaner, and safer, in fact better every way, another evidence that tea-manufacture is not the mysterious, complicated process that for centuries it has been supposed to be.

After the leaves are quite dry and crisp it is called tea, the manufacture being completed for black tea.

It is perhaps unnecessary to repeat that green and black teas are made from the same plant. The fact that in certain districts green tea is made exclusively, and in other districts only black teas are made, has been adduced in support of the supposition that the plants producing them are distinct. The reason is, that those who make black teas do not necessarily have the conveniences for the manufacture of green teas; hence certain localities will be occupied by green-tea manufacturers, and they confine themselves solely to that kind. Something will also be attributable to climate and soil; small-leaved varieties of the tea-plant, and a rapidly elongated succulent growth, are best for green teas, and the Chinese tea-plants are better for green-teas than the Assam plants, which are of a more robust growth.

In the manufacture of green tea the leaf is not withered or fermented, but as soon as the leaves are picked they are placed in pans which are heated to about 160 degrees Fah. Here they are stirred with sticks for about 10 minutes, when they become moist and sticky. The contents are then removed from the pans and rolled for two or three minutes on a table until it gets slightly twisted. The leaves are then spread in the sun, and again subjected to a rolling process, which gives them a further twist; they are then placed in the pans as before and stirred with sticks until they become very hot, when they are stuffed tightly in bags, where they remain for 10 or 12 hours. They are then finished in the pans heated to 160 degrees, dropping to 120 degrees at the finish. This last panning requires from 8 to 9 hours' constant stirring, for upon

this depends the production of the green color. It is a laborious operation, and after all, depends simply upon the rapidity of the drying process, and the absence of fermentation.

The grade of tea called Flowery Pekoe in black teas is called Young Hyson in green, and that corresponding to Orange Pekoe in black is Gunpowder in green; Pekoe in black is Hyson in green. Souchong in black is Imperial in green, and Congou in black is Twankay in green.

There are numerous fanciful names given to teas, but the above is said to comprise all that are worthy of being distinguished; all others are merely commercial distinctions.

The finest of all Chinese teas are those called Mandarin teas, which being but slightly fired and rather damp when in the fittest state for use, will bear neither transportation nor keeping. They are solely used in China.

The flavoring of tea is also a well-known process, and is only applied to middling and inferior qualities of the article. Various odoriferous flowers are employed for this purpose. Orange-flowers and the blossoms of jasmynes are the favorites, although several other kinds are also used, such as the flowers of *Gardenia florida*, *Olea fragrans*, *Magnolia fuscata*, *Chloranthus inconspicuous*, *Illicium anisatum*, and various kinds of roses. The process of scenting teas is described as follows:

The tea is first perfectly manipulated, dried, and ready for market; 40 pounds of fresh orange-blossoms are mixed with 100 pounds of the dried tea; after 24 hours the orange-flowers are removed by sifting. The tea is now strongly impregnated with the odor of the flower, but it has also absorbed moisture from the fresh flowers, which is now removed by drying. The scent increases after the tea is packed in cases. The length of time which teas thus scented retain their odor varies with the different flowers used; some lose it in one year, others retain it for a longer period.

Tea is adulterated in many ways; the green color is often imparted by heating and manipulating it with Prussian blue, gypsum, and indigo. Tea-dust is mixed with clay and manipulated into the form of the ordinary leaf and sold as lie-tea. Tea-leaves which have been already used are again rolled into shape and sold as genuine tea. The leaves of other plants are added to those of the tea-plant, and thus the quality is impaired, or an undue proportion of stalk is added to the leaf, and the weight increased while its chemical value is lessened.

The following substances, it has been stated, have been found in tea: Iron, plumbago, chalk, China clay, sand, Prussian blue, indigo, turmeric, starch, gypsum, catechu, gum, and the leaves of the camellia, elm, chloranthus, willow, poplar, oak, elder, beech, hawthorn, and the wild plum.

The active principles of tea are an alkaloid called *theine* and a volatile oil to which the flavor and odor are due, and which possesses narcotic and intoxicating properties. It also contains 15 per cent. of gluten and a still larger percentage of tannin. A recent authority states that the

effects of tea upon the human system is to increase the assimilation of food, both of the flesh and heat-forming kinds, and that, with abundance of food, it promotes nutrition, while in the absence of sufficient food it increases the waste of the body.

It is generally understood that much of the manipulation given to tea in Asiatic countries is directed toward fitting it for ocean voyages. For this transportation the leaves must be roasted before shipment, and thus the aroma developed by firing is largely dissipated before the tea is used. It is an old saying that the best teas are only to be had in their highest excellence in tea-growing countries, where they can be procured before they have been submitted to all the severity of the heroic processes which they have to undergo before being packed for long voyages in the holds of vessels. It may therefore, be found that, for home consumption only, a less elaborate method of preparation may suffice, and that, as already mentioned, the article may enter into domestic commerce in cakes of dried leaves pressed into solid shapes, as is done with many other herbs, and the roasting, which develops the aroma, take place immediately before use, as is now done with coffee. Probably it will ultimately be ground like coffee, to secure the most delicate beverage.

It will probably be many years before tea-culture will engage the general attention of farmers and planters of this country. There are many reasons why this may be expected. The profits of the culture are not established; the management of the plant and the proper application of the processes must be for many years of a purely experimental character, and even where seemingly fair tests have been made, failures will occur, and although these failures may be traced to causes which persistent effort would overcome, yet where there is outlay and loss, accompanied with some doubt as to ultimate success, the effort will in most cases be abandoned.

Any attempt to estimate the profits of tea-culture in this country would simply be futile; this can only be reached after we see the results of actual and fairly conducted experiments. A writer from Florida remarks that "we should grow our own tea, but we do not, and will not, unless something is done to promote an interest in the matter."

It has been suggested that the United States Government could, at a comparatively small cost, materially assist in determining as to the feasibility of tea-culture, and the solution of the question of profit. What has already been accomplished by modern tea-manufacturers in the way of improvements upon the older Asiatic methods only suggests that still further innovations may be possible.

Seeing that much of the care bestowed upon the manufacture of tea is merely for the purpose of meeting commercial exactions in regard to the appearance of the article, it may be, that, by ignoring mere appearance, an equally good beverage may be produced by an entirely different system of preparation of the leaf. Of this I have strong hopes.

We procure the essential virtues of other herbs without subjecting them to such complicated processes, which, after all, are mainly to prevent the leaf from molding and decomposition, and there seems to be no valid reason why tea should differ from other herbs in this respect.

These questions could be answered in a few years if the government were to secure, say 20 acres of land in a suitable locality, and plant a portion of it yearly with tea-plants until 10 or 12 acres were planted. Then, when the plants become sufficiently matured, provide a small laboratory, fitted with the necessary apparatus, and place it in charge of a competent person who would make such experiments in the preparation of the leaf as might be suggested. This service need not cost more than \$20,000 or \$25,000; but it would require at least six years for its completion.

Doubts have been expressed as to the suitability of our soils and climates to produce as good an article of tea as is produced in Asia. Practical cultivators are aware that soils and climates exert certain influences upon vegetation; but these influences are potent everywhere. Natural causes are not spasmodic in their operations. In a special report of the Department of Agriculture, issued in 1877, we find extracts from letters submitted by cultivators of the tea-plant in the United States, some of which are here inserted.

Mr. THOMAS M. COX, Greenville, S. C., says:

Dr. Junius Smith was probably the first person who introduced the tea-plant into South Carolina. He was, I think, a native of Massachusetts, and had a daughter married to a gentleman connected with the English naval service, and resided with her in the East Indies. From them he received the seed, and probably some of the plants. He was very successful, but is now deceased, and his plants, without protection, were lost. I obtained, in 1857 or 1858, from the Patent Office, a box of tea-plants. I gave the most of them away, and retained a few myself. They have grown well without any protection, in the open air, and have attained a height of 8 or 10 feet. They have frequently matured the seed, and there are a number of the seed on the ground at this time. They are an evergreen in this climate, and are now in flower, with the seed of last year's growth fully matured upon the bush. I have never succeeded in making tea from the leaves, not knowing the process of manipulating them.

Mr. J. J. LUCAS, Society Hill, S. C., says:

The tea-plant has been grown successfully in this State, Georgia, and Louisiana. Dr. Junius Smith, late of Greenville, S. C., planted it more extensively than any one else in this State, but concluded that labor was too costly to make the culture profitable. Dr. Thomas Smith, of this place, and General Gillespie, of Cheraw, obtained a few plants about the same time that Dr. Junius Smith did, but did not attempt to make tea. General Gillespie's plants are still living and thriving. On the Middleton place, Ashley River, near Charleston, tea-plants are now growing, for ornamental use only, and are 10 feet high. A gentleman in Georgia (says the Rural Carolinian) obtained 441 pounds of tea from one acre of land, which, at 50 cents a pound, would bring \$220.50. Our average cotton-yield is about \$15 per acre; our best about \$40.

It is recommended to plant 5 by 5 feet, or 1,764 plants to the acre. Mrs. R. J. Screven, of Liberty County, Georgia, says the tea-plant thrives as high up as Athens, and is more liable to injury from heat than cold. The editor of the Soil of the South,

New Orleans, succeeded so well that he was offered \$1.50 per pound for his make of tea. Cotton is now, in price, below the cost of production, and we must try something else.

Dr. TURNER WILSON, Windsor, N. C., says :

I send you a package of green tea-leaves, blossoms, and a few seed in the capsules I have no person that understands curing the leaves, but will send a package of the dried leaves, as I term them. I frequently drink a simple infusion of the leaves dried in the shade (in the attic), and though not so good as the Chinese preparation, yet I know that I am drinking the *pure* tea, without any coloring-matter like plaster of Paris or prussiate of iron.

I have been raising the tea since 1858, but without much cultivation. My yard and garden are sandy soil, and the plants or bushes, without any cultivation, are of slow growth. I plant the seed about the 1st of April, but they come up under the bushes very thick from the fallen seed. Sometimes I throw a little dirt on the seed which I do not pick up. I have several hundred plants under the bushes, from 4 to 12 inches high, and about fifty in my front yard. I have never sold any seeds or plants, but could do so. I have distributed them from Maryland to Texas in small quantities. The leaves may be picked in May, July, and September. The last any time before frost. The cost of picking would be a mere trifle, as one hand could pick two or three bushels a day.

The curing of the leaves should be done in copper pans of different degrees of heat; but as none of my family, except myself, drink tea, I put up with the inferior curing in iron pots and ovens, or stove-pans. Dry in the shade, and pack tight in boxes or jars. The young tender leaves no doubt make the finest green teas; the old, full-grown, and refuse leaves, the black tea.

JAMES H. RION, Esq., Winnsboro, S. C., says :

I have no experience in the making of tea, but can certify to the adaptability of the soil and climate of my section to the growth of the plant itself. I live in Fairfield County, which is a little north of the center of the State. In the fall of 1859 I received from the Patent Office, Washington (of which the Agricultural Department is a part successor), a very tiny tea-plant, which I placed in my flower-garden as a curiosity. It has grown well, has always been free from any disease, has had full outdoor exposure, and attained its present height (5 feet 8 inches) in the year 1865. Since then it has been occasionally trimmed. The bush is like a ball resting on the ground, its breadth being equal to its height. It is continually producing perfect seeds, which readily germinate and produce healthy seedlings. The seeds are the size of small filberts. This shows that the plant finds itself entirely *at home* where it is growing. There cannot be the least doubt but that the tea-plant will flourish in South Carolina.

Mr. H. B. HOLLIDAY, Valdosta, Ga., says :

We have but two tea-plants, which have done well. They were brought to this place by Samuel Varnadoe, now deceased, from Liberty County, Georgia. William Jones and Mrs. Rosa Sereven, of Liberty County, are now raising tea, and I have just been told that it does well. Their post-office is Dorchester, Liberty County, Ga., via No. 2 Atlantic and Gulf Railroad.

Mr. W. M. IVES, Jr., Lake City, Fla., says :

The seeds of the tea-plant were obtained from the Patent Office about the year 1858. The plants can be propagated either from seeds or slips. It is an evergreen shrub. I think five years from seed, or three years from slips, would be as early as a crop of leaves could be taken. After that the crop would increase annually.

Its cultivation might be made profitable, but our people do not pay enough attention to such objects as promise returns in future years. The method of drying the leaves is a very simple process. Many families already possess a number of tea-plants, but they grow them simply for their beauty and novelty. Tea can be grown in Georgia

as well as in Florida. We should grow our own tea, but we do not, and will not, unless something is done to promote an interest in the matter.

Mr. JAMES S. MURDOCK, Charleston, S. C., says :

I would also mention that the tea-plant is well suited to our climate. A gentleman at Georgetown, on our coast, writes me that he has raised a large number of plants from the seed, and they are as thrifty and grow as well as our wild orange, the cold weather, which we have occasionally, producing no effect on them.

Dr. A. W. THORNTON, Portland, Oreg., says :

Some years ago a capitalist, Mr. Samuel Brannan, started the cultivation of tea at Calistoga, in Napa County, California, but through some mismanagement at the outset the crop did not succeed. And as at that time capitalists could make their 3 per cent. a month in other enterprises, Mr. Brannan saw no money in it, and abandoned the enterprise. But to this day solitary plants can be seen in that locality, exhibiting vigorous growth, proving the suitability of both soil and climate. Since that time a gentleman (name forgotten) started a plantation of tea at Modesto, in the foot-hills of the Sierra Nevada Mountains, Stanislaus County, California, in which the plants have done so well that from the last accounts he was so far encouraged as to extend his plantation; but as yet I have not heard of it as coming into the market as a finished article of commerce.

With regard to Oregon and Washington Territory, I am not aware that the experiment has been tried yet, although there are localities in Southern Oregon, about Jackson County and the Rogue River country, and perhaps east of the Cascade Range, where the summers are warmer and the winters are colder and drier, in which the plant would flourish, though subject to a ground freeze in winter. In the Willamette Valley the *Wistaria sinensis* does well in the open air, but *Fuchsias* and *Salvia splendens* require to be taken into shelter in winter.

That the tea-plant is admirably suited to Northern California and Southern Oregon I have no question; more especially as the light on this coast is so abundantly charged with actinic rays, as shown by the richness of the foliage and gorgeous tints of the fruits and autumnal foliage, supports the view that any plant, the active principle of which is located in the leaves, would *prima facie* yield a richer product where actinic rays are abundant (which are known to have an important influence upon chlorophyll and leaf-development) than in less favored climes.

That the moisture of Northern Oregon and Washington Territory might give rankness to the leaf development inimical to the plant as a commercial product can only be proved by experiment, and, if so, might be sufficiently modified by a system of pinching back in summer and not pruning in winter or fall.

I have not been sufficiently long in Oregon to form an opinion of the winters from actual experiment; and the hearsay opinions of others are of very little value with respect to any special inquiry, the subject-matter of which they are unacquainted with, unless, indeed, they happen to be men of scientific education, capable of appreciating the value and influence of natural laws so far as at present developed.

Mr. ARTHUR P. FORD, Charleston, S. C., says :

About four or five years ago I obtained from a friend some seeds of the tea-plant, and planted them in my garden, twenty-one miles from Charleston, inland. The plants came up readily, were duly transplanted, and are now fine shrubs three feet high, and seven in number. The foliage is luxuriant; and the plants bear the coldest weather here without any ill effects; the mercury on more than one occasion marking 16°; and the plants being encased in ice at other times also.

Owing to my unavoidable absence during the past two summers, I have been unable to gather and prepare the leaves.

I am satisfied that both tea and coffee plants would succeed in the South, and it would be well if our planters could be induced to experiment with both.

WILLIAM SUMMER, Esq., Newberry County, South Carolina, says:

There are several healthy, vigorous tea-plants growing in Columbia; these plants have been cut back to keep them in proper condition in the grounds where planted. I have seen at the Greenville residence of the late Hon. J. R. Poinsett the tea-plants growing finely, of those introduced by Dr. Junius Smith. And he remarked to me that we have here the *Olea fragrans* (fragrant olive), with which we can flavor the tea equal to any prepared for the special use of the Emperor of China. The fragrant olive blooms freely from early spring until midwinter, and the flowers, when gathered fresh and put in the caddy among the tea, impart a delightful aroma to the tea. I have at different times imported a few tea-plants from Angers, France, and these have been disseminated from the Pomaria nurseries, and found to succeed. I have no doubt of the success of the tea-plant in the middle and upper portions of this State.

Col. S. D. MORGAN, Nashville, Tenn., says:

Of all the plants for the South Atlantic States, that of the Chinese or Japanese tea promises most success. Before the war I had a few of the shrubs growing in a small parterre attached to my town dwelling, from which I obtained leaves as rich in aroma and "theine" as is to be found in tea from any country whatever.

The shrub grows luxuriantly in Central Georgia—even 100 miles north of Augusta, to my personal knowledge—as I there used the domestic article for several weeks' time and found it excellent. There may, however, be a difficulty about its culture, for want of a very cheap class of laborers to pick and prepare the leaves. This, however, is a subject I have not investigated, but I think it is worthy of a thorough investigation.

Mrs. MARY J. IVES, Lake City, Fla., says:

Your letter making inquiries in regard to the tea-plant has been received.

My husband obtained the plants, through a friend, from the Department of Agriculture at Washington, in the year 1858. They were then small plants, only a few inches in height. Now they are large shrubs.

I have used the leaves for making tea, and those who have tasted it have pronounced it of a very fine flavor. Am sorry that I have none on hand at present, that I might send you a sample.

The plant is not at all affected by cold weather, such as we have in this climate, blooms and bears seeds, and can be propagated by cuttings as well as by the seed. By this mail I send you some seed.

Miss M. C. McFALL, High Shoals, Anderson County, South Carolina, says:

I take pleasure in informing you that I have a tea-plant which I have had fifteen years, and which was sent me by Col. J. D. Ashmore while he was in Congress. It has remained in the center of the garden where it was originally planted, and has had no care or cultivation. Fifty plants, I suppose, could have been reset from the young seedlings sprung up beneath it from the fallen seeds, but I was afraid to disturb them. This year I have cured some of the leaves, and will send you a sample. I have had no one to show me how to prepare them. I have given away five pounds of the tea, and have been using it in the family all the year. The plant is an evergreen, and stands the winters perfectly well. It is 8 feet in height, 4 feet in diameter, and never has been pruned or trimmed.

Mr. ALEX. M. FORSTER, Georgetown, S. C., says:

In reply to your letter received through Mr. Murdock, I will give you what little experience I have had with the tea-plant in this low country of South Carolina.

The original plant I brought from Columbia, S. C. It is a genuine *Thea viridis*, from seed, I think, produced from the tea-plants brought to this State some years since by

Dr. Junius Smith, and cultivated near Greenville. After my plant had attained the height of two or three feet, it began to bear flowers and seed. From these seeds, or nuts, I have now 50 or 60 plants of various sizes; some of them bearing fruit also. I might have had 500 plants as well as 50, so easily are they propagated and so abundantly do they bear seed. The only care necessary is to preserve the tap-root as carefully as may be in removing the young plants from the nursery-bed. My plants are in a rich, dry soil, and grow very rapidly, requiring only three or four years to reach the height of 4 feet. They are as thrifty and bear the vicissitudes of our climate as well as the native cassina (*Ilex cassine*). I have several times picked (in April) a quantity of the young leaves, and commenced the process of curing them according to the directions given by Mr. Fortune (see Agricultural Reports, 1853), but I have never had the perseverance to carry out fully the entire process, as it occupies hours to complete it, and requires the patience of a Chinaman; yet I have made some fair black tea, better than much that is said to have come from China and for which I have paid \$1.25 per pound.

The Chinese method of curing tea is impossible in this country, where we cannot obtain labor at 5 to 10 cents per day; yet some equivalent to this process is necessary to the production of tea, such as we drink it, for a decoction of the tea-leaves dried without this manipulation has little resemblance to the beverage we all so much appreciate. I am convinced that the slow rolling and pressing at certain intervals, and then the heating and rolling over and over before the final drying, are required to break the sap-vessels in the leaves, in order to produce in the juices, by contact with the air, a certain degree of fermentation necessary to bring out the flavor or develop the properties we find in the Chinese preparation. If there could be invented some machine to imitate this hand labor, to effect the same slow process by means less expensive than the human hand, I think that the cultivation of tea might become not only practicable, but profitable to a large portion of our Southern country.

Rev. W. A. MERIWETHER, Columbia, S. C., says:

I obtained a Chinese tea-plant from North Carolina nine years ago, and set it out in open ground in a plat of Bermuda grass. It has received no cultivation, and is now a fine shrub, measuring to-day six and a half feet in height by nine feet across the branches at the base. The soil where it grows is light, sandy land, with no clay within two feet of the surface.

The plant is not affected by the severest cold to which our climate is subject. It was not the least injured by the intense cold of December, 1870, when my thermometer registered 1° above zero; the coldest weather I have ever known in this latitude.

My plant blooms from the latter part of August on to December, and makes a beautiful ornamental shrub. It is evergreen. I have obtained tea of the best quality from the cured leaves. The process of preparing the leaves for use is the same as that given in the Southern Cultivator, January number, 1872. There have been successful experiments made with this plant in Florida and in Georgia. That the climate of the Southern States is well suited to the cultivation of the tea-plant I think there can be no question. I sincerely hope you may succeed in your efforts to arouse our people to the importance of its cultivation. If only enough tea were made to supply the home demand, what an immense annual saving would result!

Hon. JAMES EDWARD CALHOUN, Trotter's Shoals, Savannah River, S. C., says:

At my last visit to Rio de Janeiro, a treatise on tea-culture, written in Portuguese, was presented me by the author, the priest-superintendent of the imperial botanic garden.

On my return I was traveling in company with the governor toward Greenville district, when the death of Junius Smith was rumored. I urged the governor to deflect from his route to inspect the tea-plants, and, if it might be, in his official capacity to

assume the carrying out the experiment instituted by Mr. Smith, promising, in such case, to make a translation of the treatise and send it to him. No steps, however, were taken in that direction. In acknowledging your communication, I renewed the promise to make the translation for your department. A prolonged, unsuccessful search among my papers for the treatise has been one cause of the delay of my answer.

Few words will suffice to detail my experience. Eighteen years ago some half-dozen tea-plants, brought from China, were sent me. I set them in what had been a strawberry-bed, in a soil friable, of medium quality, unmanured. The war and its consequences supervening, I have contented myself with merely securing a supply of tea for my household. Nothing has been done beyond keeping down the weeds with the hoe. The plants have had no protection; but during a portion of the first summer, seedlings have some shelter. As yet there has been no damage from blight or from insects. Frequently leaves are clipped in moderation from all parts of the bush, care being taken not to denude. They are parched in an iron vessel at the kitchen fire, constantly stirred, and immediately afterward packed in air-tight boxes. To prepare them for infusion, they are ground in a coffee-mill. I inclose leaves plucked to-day, measuring from $3\frac{1}{4}$ to 5 inches, and as you will perceive exhibiting three varieties.

The capsules of the tea-nuts afford the most pleasant of bitters. They were saved and given to the matron, an item in her *materia medica* for my people, long before I heard that a physician in Georgia had carefully tested the "tea-hull," and found it to possess all the properties of the cinchona.

The plants have buds, blooms, and fruit. As the latter drop, a portion are planted. The remainder are kept in brown sugar, and reserved for planting in mid-winter. They are ornamental and marvelously fecund.

At the axil of every leaf there is a bud; often two, sometimes three buds. They would be invaluable to the apiarian.

On the 12th of November frost stopped the blooming of cotton, but swarms of the honey-bee continued to visit the fresh blossoms of the tea-plants. Bumble-bees and yellow-jackets also present themselves. The latter, feeding differently from the others, fall to the ground gorged.

This is the perfect climate for the tea-plant.

Mr. S. I. JONES, Thomasville, Ga., says :

Your favor relative to the tea, its cultivation and preparation, has been received. Inclosed please find an article written by my sister, Mrs. Screven, of Liberty County, Georgia, who has had some experience in tea-making, and has plants for sale. I have several hundred plants on my farm near this place, and from which I make a good article for home use. I soon hope to have five acres set out. I prepare the tea similarly to Mrs. Screven.

Mrs. R. J. SCREVEN, McIntosh, Liberty County, Ga., says :

In response to your request for an account of the tea-plant, and also of the process of preparing the leaves, I herewith give you my experience. Mr. Robert Fortune, in his "Two Visits to China," says: "The soil in which the tea-plant does best is moderately rich; that is, it contains a considerable amount of vegetable matter, mixed with clay, sand, and particles of rock." My experience is that it does best in land somewhat low, but not such as water will lie upon or is overflowed. I sow the seed in the fall, as soon as they ripen and drop from the bushes, in drills eighteen inches apart. They come up readily in the spring, and by winter are from three to six inches high. Under the shade of some large tree is usually the place selected for sowing the seed, for if the plants are exposed to the hot sun while young, they invariably die the first summer. When six months old they are ready for transplanting; have generally a good supply of roots, and can be set out any time from the first of November to the last of March. In putting them out, I have generally prepared holes to receive them, to give a good start, so that fine, healthy bushes will be obtained.

The holes are usually dug out a foot or more deep, and equally as wide, and filled in with half-rotted leaves, a little cow-pen manure and surface soil; all of this to be packed down to prevent water settling around the plants whenever it rains. The tea is planted up to its first leaves, and a little water given to press the earth close to the roots. As soon as the warm spring weather begins, each plant is shaded from the sun. A crutch, two feet out of the ground, is driven in on each side of the plant, a strong stick placed across the crutches, and pine branches leaning upon this make a cheap and good shade.

The tea, when young and not large enough to shade its own roots, is very sensitive to the heat of the sun. This shading being somewhat troublesome, I have adopted another plan. It is this: to set out the plants under the shade of some large bush or tree until they are about two feet high, then take them up carefully, cut off nearly all the tops, and plant out in their permanent places. As soon as spring opens they will put out sufficient leaves to shade their own roots. In April, 1867, I think it was, Mr. Howard, from Baltimore, who has been engaged on a plantation for several years in the East, visited my father's plantation in this county. He expressed himself as surprised at the splendid growth of the tea. Being there at the time of gathering the young leaves, he plucked from one bush alone, prepared the tea himself, and took it on to Baltimore, where he had it tested and weighed. He wrote back that it had been pronounced stronger and of superior flavor to the imported, and that by calculation he was satisfied that four hundred and fifty pounds of cured tea could be made here at the South to one acre of ground.

Mr. Fortune, in writing of the tea-growing districts of China, states that at Hong-Hong, in summer, the maximum heat is 94° Fahrenheit, and the minimum 80°, while in winter the thermometer sometimes sinks as low as the freezing-point. At Shanghai the extremes of heat and cold are much greater. Here the thermometer sometimes indicates a temperature of 100° for several days successively in summer, and in winter frequently falls to twelve or twenty degrees below the freezing-point.

MODE OF PREPARING.

I have only prepared black tea, the process being very easy and simple.

The leaves are gathered the day before they are to be dried, and spread thinly over tables to wilt. The small leaves are cured by themselves, as they make the most superior quality of tea. The day after being plucked, they are taken in the hands and rubbed until they become soft and flaccid. They are then placed in heaps and allowed to remain so for about one hour. They are then put into a Dutch oven, which is heated by a few coals under it. While in the oven they are constantly stirred with the hand to prevent scorching. They are roasted five minutes, taken out, and rolled again upon the table. After being rolled, they are exposed in the open air in the sun, and frequently stirred. While these are out in the air, another set is in the oven. When all have been roasted, those first put out in the air are brought in, and roasted again for five minutes, then taken out and rolled again. They are now placed in a sieve about an inch thick, and held over a few hot coals, stirring all the time. They are then taken out and rolled again. This process of rolling and toasting is continued until the tea assumes a dark color.

After all the leaves have been treated thus, they are put in a basket and hung over a few coals, and frequently stirred until the tea appears black and dry. Mr. Fortune, during his visit to China, "verified the opinion previously formed that black and green teas could be produced from the same plant, and that the dissimilarity of appearance, so far as color is concerned, depended only upon manipulation," green tea being produced by coloring black tea with a powder of three parts Prussian blue and four parts gypsum, applied to the tea during the last process of roasting. I have several times received letters asking if I had the plant for sale from which the green tea was made, and as my authority was not sufficient to convince them that the same

plant produces both black and green, I have quoted Mr. Fortune, whose botanical knowledge and learning cannot for one moment be doubted.

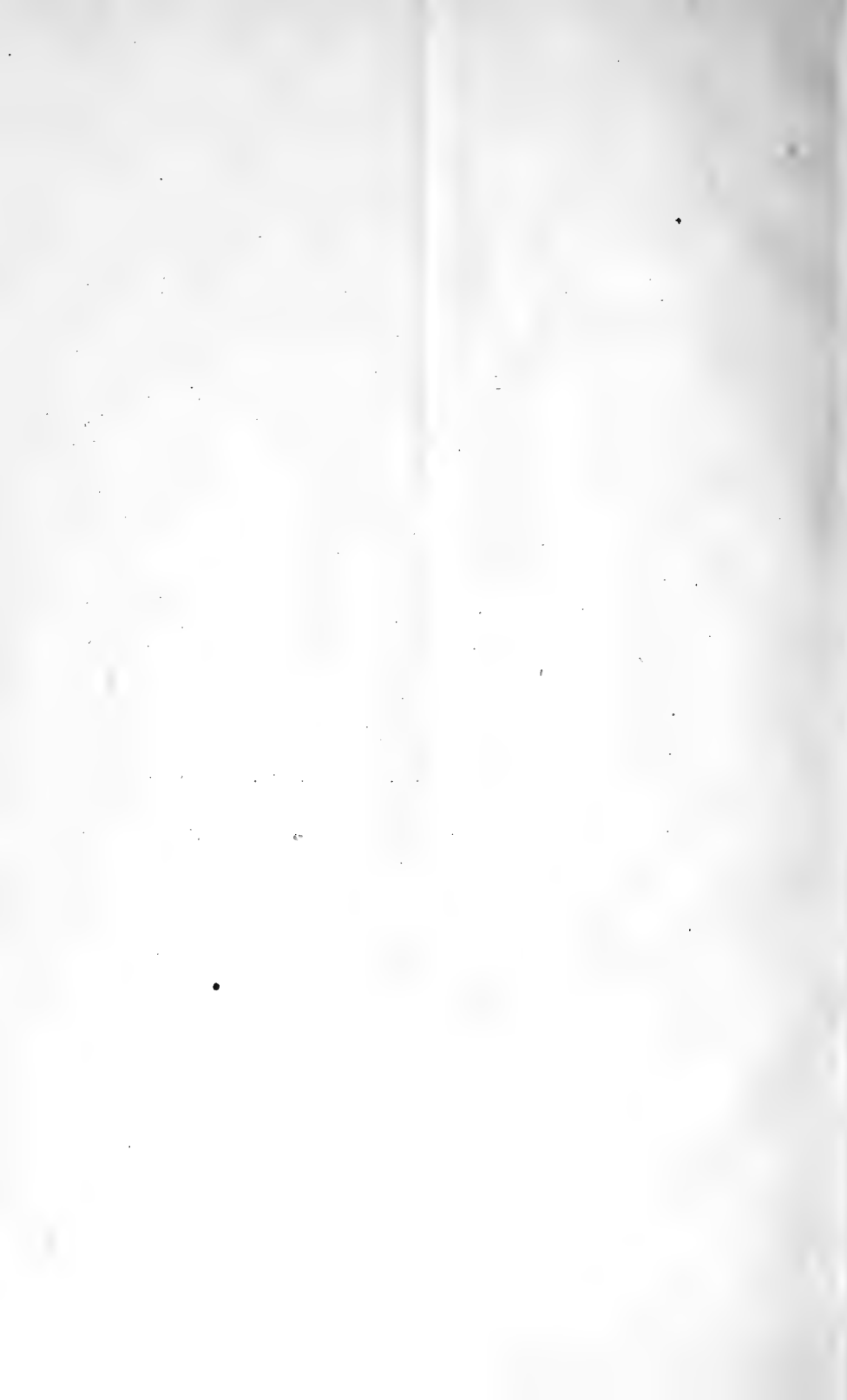
Mr. J. W. PEARCE, Fayetteville, N. C., says :

Your favor of October 27, in regard to the Chinese tea-plant, was received a few days ago. The original seeds were sent to me, about the year 1860 or 1861, by Hon. Warren Winslow, then member of Congress from this district. I gave the greater part of them to Mr. James M. Smith, a successful horticulturist of this vicinity, and kept the rest myself. We planted them in light sandy land, and they have grown and flourished ever since without any particular attention.

My plants are now about five feet high, and very thick and bushy near the ground, covering a space as large as a molasses hogshead; have no protection from any kind of weather. The mercury has been as low as 10° below zero. They do not seem to suffer from drought, are ever green, and bear a beautiful white flower, with little scent until nearly ready to fall. The bees are very fond of the flowers. The seed are like the hazel-nut; have a hard shell and a bitter kernel, and take a long time to germinate. Hence it is better to plant them on the north side of a fence or house, where they will remain moist. They come up readily when left under the bushes where they have dropped. The plants can then be set out successfully, care being taken to avoid breaking the long tap-root peculiar to them. My plants have never suffered from insects of any kind. Half a dozen plants furnish my family, of five or six persons, with more tea than we can use. We prepare it by heating the leaves in an oven until wilted, then squeeze them by hand until a juice is expressed from them, then dry them again in the oven. The tea is then quite fragrant and ready for use. It improves by age. We pick the leaves about three times during the year. The younger the leaves the better the tea. I think it will grow in any ordinary soil, clay or sand. The seed should be planted about the month of January.

I could select much more evidence as to the quality of tea produced by ordinary domestic processes, but it is sufficiently well ascertained that it is within the capacity of hundreds of thousands of people in this country to grow and prepare all the tea they require, leaving the question of its profitable commercial culture to be settled by practical test.

WASHINGTON, D. C.











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