THE

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The price of sugar in New York, at latest advices, was firm at 5 9-16 for Cuban centrifugals of 96 degrees test. Beet sugar in London showed an advance over the previous month.

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The second beet sugar plant imported by Col. Spreckels from Germany has lately arrived at San Franciso, and will shortly be erected. It is a duplicate of the Watsonville plant.

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Among the passengers by the Australia was Colonel Claus Spreckels, who is accompanied by his wife and daughter. The Colonel's visit is partly for rest and partly on account of business in connection with his large planting interests here.

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Colonel Spalding has recently returned from an extended visit to America and Europe. Having been appointed as Hawaiian Commissioner to the Paris Exposition, his official duties in this capacity kept him in that city for several months, and he has rendered to Hawaii a public service, for which he deserves at least the thanks of the Legislature. By the Mariposa he returned to Europe to join his family.

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A correspondent on Maui writes that the new diffusion plant erected by the Hamakuapoko Sugar Company is at last working well. A great many changes had to be made, some portions of the works being too weak, necessitating re-construction. The greatest changes were made in the running gear for the transmission of power. Various experiments were tried, as is often the case in new enterprises. At present everything works smoothly, in the batteries, the carriers, the cutting knives, pumps, etc. The exhausted chips furnish good fuel and burn well, the only trouble is there is not enough of them. We hope to receive a full report of this enterprise at the close of the season.

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THE AMERICAN TARIFF BILL.

At the latest dates from Washington (June 20), the tariff bill had not passed the Senate, but had been reported on by the Finance Committee with several important amendments, which will require its being referred to a joint committee.

Among the changes adopted by the Senate was a duty of 3-10 of a cent per pound on sugars of No. 13, 14 and 15 Dutch standard, while those of 16 and over will pay 6-10 of one cent per pound, or sixty cents on every 100 pounds. All sugars of any kind under 13 in color will be free. This seems to be a more rational basis than that proposed by the House, and for this reason, we think will be adopted. Willett & Gray's circular gives the following explanation for this change made by the Senate: "The Senate Committee are making more rapid progress than was generally anticipated and have reached the sugar schedule. An effort will be made to retain a small duty on all sugar up to No. 16, as an offset for bounties to be paid producers, and this meets with favor of those who think that free sugar may result in insufficient revenue, and with those who fear that bounty, unless it is collected from sugar, will become unpopular in a few years."

The free sugar bill is extremely popular with the masses in America, and is bound to become an established fact. One cause of this is, no doubt, to be found in the popular hostility to the sugar trust, which is everywhere looked upon as a combination organized for the sole object of making money out of a leading necessary of life. Whether true or not, this is unquestionably the chief reason why the masses call for an abolition of the sugar duty.

If the duty is reduced to the rates quoted, for centrifugals and refined, it will shut out the European refined beet sugars to a large extent, and compel sugar countries to supply America with dark grades for refining purposes, and thus protect the American sugar refining industry, at the same time that it will continue to afford to Hawaii a small benefit under the reciprocity treaty.

WITH OUR READERS.

An article will be found on page 249 illustrating the operation of the new tariff, so far as it relates to sugar. The changes made by the Senate in the rates, if adopted, will operate to exclude European beet sugars, unless shipped as unrefined, for which some process may perhaps be devised to make it pay the European producers.

It is not generally known that canes have been raised from the seed in Java for many years past, yet such appears to have been the case, as shown by an article on page 252.

Forestry is every year enlisting more attention and study, as the increasing demand for timber results in denuding large tracts of land which formerly were densely covered with forests, and thus changing the climatic conditions of large sections of country. An interesting article on the subject will be found on page 254, in which it is shown how forests may be preserved by reproduction.

Nowhere in American or European history, has so marked an instance been furnished of the commercial advantages to both the nations interested in it, as has been illustrated by the record of the United States and Hawaii during the past fourteen years. This may be seen by a perusal of "Some results of Reciprocity," on page 258, where our combined export and import trade with America has grown from less than two millions in 1875 to $15,769,562 in 1889. Free trade between these two nations would undoubtedly carry it to $25,000,000 within five years. If so let us have a free trade treaty.

Last month we briefly referred to the desirability of cultivating the soft-shell walnut for its timber. We find an article, inserted on page 260, which emphasizes this with a force which we trust will lead to experiments being made on a liberal scale.

Whatever tends to throw light on the diseases of sugarcane is of interest to planters. The article on page 265, giving minute details of the cane disease in Java will enable planters to know the disease should it ever appear in their fields, which, however, is not at all likely, unless some plants should be imported with the disease attached.

Did it ever occur to any of our readers, when hoeing a hill of cane or corn, or trimming trees or flowers, that every plant eats, drinks, breathes and digests its food in much the same way as animals do? Read "Plant Nutrition," on page 272, and you will find this demonstrated. The article is a very scientific one, and every reader may not take in its whole meaning on the first perusal. But it will bear a second reading, and carry conviction with it. The truth is, we do not yet fully comprehend the working of nature, and acknowledge that the same organic system pervades all living things, animate or inanimate, pointing the intelligent mind to one Supreme Creator of all.

If guaranteed a bounty, such as European producers possess and America promises, the future of sugar production in America will one day rival that of Europe. Cane and beets will grow on millions of acres, stretching 3,000 miles, from Florida to California, and the bounty soon to be awarded, backed with the unlimited capital now lying idle, must develop this industry in almost every State of the Union. The interesting account of one of the first cane enterprises started in Florida, on page 281, will show what a field is opening there for sugarcane culture. The climate is milder and the season longer than in Louisiana, and these requisites will give Florida a vast advantage from the very start.

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THE VEDALIA CARDINALIS.

The following letter from Mr. Coquillett will be read with interest by all who appreciate the necessity of prompt action regarding the insect pests which seem to be increasing on our trees and plants. The information that the letter gives concerning the orange, sugarcane and coffee pests is also valuable.

It has been noticed that the cottony scales are not now as abundant on the monkey-pod trees as they were, and it is probable that they have their seasons for ravaging the trees which they attack. Among these are the inga tree, iron wood, algeroba and some of the flowering shrubs. They appear to show a partiality for some trees, and have not, so far as has been noticed, been found on sugarcane.

The questions asked by Mr. Coquillett are interesting, and we trust that some of our orange growers will be able to give the information asked by him.

LOS ANGELES, Cal., June 10, 1890.

MR. A. JAEGER:

Dear Sir :—Your very interesting letter of May 17, and the box of specimens of insect pests were duly received, and I thank you very much indeed for both of them.

I am sorry not to be able to send you a colony of the Australian Lady-birds (*Vedalia cardinalis*) that prey upon the fluted, or cottony cushion scale (*Icerga purchasi*); they have nearly exterminated these scales upon this coast, and are now so scarce that it would be impossible to find a colony for you. They will not feed upon any other insect than the *Icerga*, and when these are no longer to be found they attack and feed upon each other. This accounts for their being so scarce here now. They are reported as being quite abundant in certain parts of New Zealand, and you might succeed in obtaining a colony by applying to Mr. William Maskell, Wellington, New Zealand. Mr. Broderick has not yet called on me nor communicated with me, but when I see or hear from him I will inform him of the situation and have him return you the draft you speak of having sent him for procuring the *Vedalias*. Of course it is possible that the *Vedalias* may become more plentiful here in the latter part of the season, and if they do I will try to send a colony of them to you. If you can obtain a colony from Maskell, have him send them to you in a wooden box, along with an abundance of *Icergas* for them to feed upon, and when they arrive, simply remove the lid of the box and fasten the box in a tree thickly infested with the *Icergas;* the *Vedalias* will then take care of themselves.

The *aphis* you sent, from orange trees, appears to be identical with the one we have here, the *Aphis rumicis*. In this species, some of the wingless ones, the *pupae*, have several whitish warts on the back. Have you ever observed such warts on any individuals among those occurring on your orange trees? I do not know of any other kind of *aphis* which has warts of this kind on the backs of the *pupae*. The orange *aphis* here becomes nearly exterminated every spring by the attacks of two kinds of parasites which cause the *aphis* to swell up in a globular form and finally become hard and of a light brown color. Do you have parasites of this kind out there? If not I could probably send you a colony. Are these *aphis* on your orange trees throughout the entire year? Do you ever find them on any other kind of tree or plant?

The scales on coffee are a species of *Pulvinaria* unknown to me. It may be the same thing as is known in Ceylon as the *Lecanium viridis*, but it does not belong to the genus *Lecanium*, the species of which never excrete a cottony matter in which to deposit their eggs. This scale somewhat resembles the *Icerga purchasi*, but in the latter the egg-sac is firmer, not flossy, and is ribbed or fluted lengthwise.

The scale on sugarcane appears to be the *Icerga sacchari*, which is also found on the Island of Mauritius, but the specimens are too much shrunken to permit me to settle this point definitely.

The brown, naked, very convex scale on the leaves and twigs of figs are the *Lecanium hibernaculorum*, which appears to be simply a large variety of *Lecanium hemispharrium*.

These specimens are of very much interest to me, and if, in the future you meet with any other kind of injurious insect, especially those which attack cultivated plants, I would be glad to receive specimens, and would gladly give you any information concerning them that I have access to.

Hoping to hear from you again,

I remain very truly yours,

D. W. Coquillett.

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INSECTS AND INSECTICIDES.

Editor Planters' Monthly :

Dear Sir:—While much has been written and talked about the coffee and scale blight throughout the islands, and as far as I can see very few practical results attained, I take the liberty of making a few suggestions as to thoroughly tested and practical remedies. Orange trees which I had growing on my land, imported from Riverside, Cal., I found for the first time in two years were infested with black smut, also the red scale *(Aspedratus aurantii Masked)*. As a remedy for scale insects, not only on orange and lemon, but on coffee also, I find the resin compound answer admirably. It was first used by Mr. Albert Koebele, one of the Entomological agents in the United States.

The proper formula for making it is as follows: Caustic soda, one pound; resin, eight pounds; water to make thirty-two gallons.

The caustic soda is first dissolved by boiling in about a gallon of water. When dissolved, one-half of the solution is taken out and the resin added to the remainder, and boiled until dissolved, after which the balance of the soda solution is added very slowly. The mixture is then boiled over a hot fire, being stirred almost constantly, and when cooked sufficiently it will assimilate with cold water like milk, which it much resembles. A sufficient quantity should then be added, the mixture being thoroughly stirred during the adding of the water, it should then be strained through a fine sieve or through a piece of thin and rather open cloth, otherwise there will be some difficulty in forcing it through a spraying nozzle. The success, to be practical and sure, depends largely upon the fineness of the spray and the thoroughness of applying it.

Pure tobacco soap is also an excellent remedy, formula of which I shall be glad to forward to any one desiring it, free of expense. As regards the parasites to which you referred lately in your valuble columns, little success will attend their introduction here, unless tents are made for their accommodation, similar to those made in the United States Propagating Stations for parasites of scale insects. They are simple, economical and practical, as they do not allow the intrusion of other vermin or the onslaught of birds, such as the mynah, etc. Shall be glad to hear from any of your correspondents on this, a matter of more than ordinary inportance.

Respectfully yours, HERBERT ADAMS, PH. G.

Honolulu, H. I., P. O. Box 441.

AMERICAN LEGISLATION INJURIOUS TO AMERICAN INDUSTRY.

The proposition to remove the duty from sugar is particularly unfortunate now that an attempt is being made to show the capabilities of the country to produce beet sugar on a large scale. The beet sugar business is no longer a problem. France, Germany and Belgium have demonstrated its success. These and other countries are now supplying one-half of the world with all its sugar, or to put the statement in another form, one-half the world's sugar is made from beets. It has been further proved that beet sugar can be produced as cheaply, if not cheaper than cane sugar. In entering upon the manufacture of beet sugar, therefore, the United States is not trying an experiment that may or may not prove successful. There is no doubt about its success. It is only a question of proper selection of soil. If American capitalists could be guaranteed proper protection from foreign sugar for the next twenty years they would show that America can produce enough sugar to satisfy all her own wants. Thus far no effort commensurate with the importance of this business has been made, but all indications point to the inauguration of such an effort at an early period, provided the tariff tinkers will let alone the duty on foreign sugar.

The great and growing want of the times in this country is an enlarged sphere for labor. Instead of transferring the field of labor to other countries, we should jealously guard all the avenues along this line, and ever be on the alert to open up new ones. Our population is steadily increasing. The old world is dumping thousands of laborers upon our shores annually. The walks of labor are becoming well-worn and less remunerative. As existing fields become less profitable, new ones must be opened, or labor troubles will multiply. The sugar industry is one of the prospectively new fields of enterprise. It is capable of supporting a large army of laborers directly, and three to five times more indirectly. It is hardly less than a crime against the American people to throw away this opportunity. If we admit foreign sugar free, we make the manufacture of beet sugar in this country impossible for many years, if not forever. By retaining the present duty we open up a new and large field of labor, capable of supporting thousands of families in comfortable circumstances for all time. We also retain at home the millions of dollars now sent abroad for sugar. A broad view of this question, such as statesmen would take, considering the future as well as the present, and the future more than the present, must convince all that the best thing to do in the matter of the sugar tariff is to let it alone.—*S. F. Bulletin.*

CORRESPONDENCE AND SELECTIONS.

THE PROPOSED AMERICAN SUGAR TARIFF.

The Sugar Schedule in the Bill reported to the House of Representatives by the Ways and Means Committee, to go into effect July 1st, 1890, is as follows:

SCHEDULE E. SUGAR.—That until July the first, nineteen hundred and five, there shall be paid, from any moneys in the Treasury not otherwise appropriated, under the provisions of section three thousand six hundred and eighty-nine of the Revised Statutes, to the producer of sugar testing not less than eighty-five degrees by the polariscope, from beets, sorghum or sugarcane grown within the United States, a bounty of two cents per pound, under such rules and regulations as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, shall prescribe.

The producer of said sugar to be entitled to said bounty shall have first filed with the Commissioner of Internal Revenue a notice of the place of production, with a general description of the machinery and methods to be employed by him, with an estimate of the amount of sugar proposed to be produced in the next ensuing year and an application for a license to so produce, to be accompanied by a bond in a penalty, and with sureties to be approved by the Commissioner of Internal Revenue, conditioned that he will faithfully observe all rules and regulations that shall be prescribed for such manufacture and production of sugar.

The Commissioner of Internal Revenue, upon receiving the application and bond hereinbefore provided for, shall issue to the applicant a license to produce sugar from sorghum, beets or sugarcane grown in the United States at the place and with the machinery and by the methods described in the application; but said license shall not extend beyond one year from the date thereof.

No bounty shall be paid to any person engaged in refining sugars which have been imported into the United States, or produced in the United States upon which the bounty herein provided for has already been paid or applied for, nor to any person unless he shall have first been licensed as herein provided, and only upon sugar produced by such persons from sorghum, beets or sugarcane grown in the United States.

The Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, shall from time to time make all needful rules and regulations for the manufacture of sugar from sorghum, beets or sugarcane grown in the United States, and shall, under the direction of the Secretary of the Treasury, exercise supervision and inspection of the manufacture thereof.

And for the payment of these bounties the Secretary of the Treasury is authorized to draw warrants on the Treasurer of the United States for such sums as shall be necessary which sums shall be certified to him by the Commissioner of Internal Revenue, by whom the bounties shall be disbursed.

All sugars, above number sixteen Dutch Standard in color, shall pay a duty of four-tenths of one cent per pound: Provided, that if an export duty shall hereafter be laid upon sugar or molasses by any country from whence the same may be imported, such sugar or molasses so imported shall be subject to duty as provided by law prior to the passage of this act.

Sugar-candy and all confectionery, including chocolate confectionery, made wholly or in part of sugar, valued at twelve cents or less per pound, and on sugars after being refined, when tinctured, colored, or in any way adulterated, five cents per pound.

All other confectionery, including chocolate confectionery, not specially provided for in this act, fifty *per centum advalorem.*

Glucose, or grape sugar, three-fourths of one cent per pound.

And on the free list is placed:

Sugars, all not above number sixteen Dutch Standard in color, all tank bottoms, all sugar drainings and sugar sweepings, syrups of cane juice, melada, concentrated melada, and concrete, and concentrated molasses and molasses.

In our circular of last week we gave our opinion as to the *general* effect of the new Tariff Bill, if passed, as now prepared. We showed what protection the refiners would receive under the provisions of the Bill, which would seem, at first glance, to prove ample; but this question should receive close study before it is finally decided. As far as concerns refined sugar from the United Kingdom or countries other than those producing beet sugar, the proposed duty of 4-10c. would give some protection, but as regards the competition by the latter countries, we find it a very different matter and a serious one to our refiners. The actual amount of protection given by the bill varies with each of the beet producing sugar refining countries, owing to the different bounties paid to their refiners. Germany appears to come closest into competition with America, and a partial reprint of the figures given by us, March 27, will show how close a competitor she may become. Granulated sugar at that date could be purchased at equal to 3⅜c. free on board in Hamburg, which, plus freight, insurance and landing charges of ¼c. per lb., and duty of 4-10c. per lb. is 4.02½c. per lb. in New York. At the same time raw beet sugar could be bought at 3.01c. per lb. free on board in Hamburg, which, plus freight, insurance and landing charges, .20c. per lb. equals 3.21c. per lb. cost at refinery in New York. Add cost of refining ⅝c. per lb. (a very low cost for refining *beet* sugar, some claiming it to be ⅞c.), and granulated can be sold without profit to the refiner, at 3.83½c. per lb. against 4.02½c. per lb. for German granulated, without profit to the importer. The protection in this case is, therefore, but .19c. per lb., or less than one-half the amount called for by the tariff, and it is a serious question for consideration whether the German refiner, dealing direct with the United States, might not be able to overcome that protection. Under the circumstances of the complications of foreign bounties it would be well before committing the refiners to a certain protection by duty, which may prove to be no protection at all, to take time to ascertain the facts. Considering Germany, with its present export bounties, it requires a duty of about ¾c. per lb. in the bill to give a 4-10c. per lb. protection. We give below a comparative table of cost of English and German granulated sugar:

	English.	German.
Cost free on board	3.81	3.375
Freight, insurance and landing charges	.25	.25
Proposed duty	.40	.40
Cost in New York	4.46c.	4.025c.

In consequence of this difference in prices England is now flooded with German refined sugar, thus giving a heavy blow to the English refining industry. Germany being the largest beet sugar producing country in the world and the cheapest, should naturally be accepted as a basis for protective duty.—*Willett & Gray's Sugar Circular, April 26.*

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THE SUGAR CANE RAISED FROM SEED IN JAVA.

Contemporaneously with the experiments carried out during the past two years by Messrs. Harrison and Bovell in Barbados on the subject of the sugar cane seeding, experiments, apparently of independent origin, were carried on by the late Dr. Soltwedel in Java. A notice of this appeared in *The Sugar Cane* of October 1st, last, and was later brought to my attention by Mr. Harrison, but which I abstained from quoting at the time because of some contradictions and errors of fact which it contains, and of uncertainty as to its authenticity and value. The notice is as follows:

"Dr. W. Kruger, writing from Kagok (Java) to the *Deutsche Zuckerindustrie*, refers to the work by Dr. Basset, 'Traite Theorique et Pratique de la culture de la canne a sucre,' which appeared last spring and excited considerable attention amongst planters and practical sugar manufacturers. Some of his remarks are interesting as dealing from the point of view of a practical cultivator with the somewhat vexed question of the reproduction of the sugar cane from seed. He says:—'As regards the native habitat of the sugar cane, there are only two kinds of wild *saccharum* to be found in Java, which according to polarization contain from three to five per cent. of sugar in the juice, and in our opinion neither of them can be considered as the original form of the cane, one of them *(saccharum spontaneum L.)* because of its whole habit of growth, etc., and the other *(S. glongong)* because its morphological peculiarities are so different.'

"It seems quite a mystery to us how the author can possibly consider that such numerous varieties can only have arisen by reproduction from seed. Not only is the formation of varieties possible (by bud variation) to a remarkable extent in the case of other cultivated plants, which, as your reviewer remarks, are never propagated by means of seed, but the great variability of the cane is known to anyone who is acquainted in however small a degree with cane cultivation, and, indeed, it has up to now been found impossible to classify the varieties of the cane in any satisfactory manner (?). His assertion that the incapability of producing mature seed cannot always have existed, is in no way confirmed by facts, but rather the opposite. Not only in the wild flora, and especially among the graminaceæ, do there exist plants which very rarely or very sparingly produce seeds *(poa bulbosa* and *andropogon ischæmum)* to which also the nearest relatives of the sugar cane in the Javanese flora belong, but the few uncultivated varieties of the cane are exactly on a par in this respect with the sugar cane in its most developed form.

"The indisputable merit, not only of pointing out that the sugar cane bears seed, but also of obtaining plants from them, belongs undoubtedly to Dr. Soltwedel, the director of the experimental station at Samarang; unfortunately he has not published any account of the morphological and anatomical experiments in connection thereto. All the reports of such experiments which have hitherto appeared, so far as we have been able to find any such, relating at one time to sorghum seed, at another to grass plants obtained, or even where canes had actually been produced, are unreliable, for in no case is there any mention of the isolation of the seed. We need only call attention to the fact that in many cases in these experiments the entire flowering panicles of the cane have been placed in the soil, and the cane plants spouting from these have been thought to have been produced from the seed. (From our experience now we can see that these were probably, I might almost say certainly, seedlings.—Ed.) Errors may very well have arisen in such cases, for the panicles of the cane are capable of producing new plants by germination? We do not share the hope which may be cherished in connection with the production of seed and obtaining cane plants from seed, partly because plants obtained from seed require much greater care than those from layers, and will in many respects disappoint the hopes entertained as regard quality, and finally because they are equally exposed to the *sereh* disease, which is not to be wondered at, considering that the latter is transmissible by propagation."

The discovery thus announced by Dr. Kruger is now confirmed, for since that date Dr. Soltwedel's experiments, alluded to above, have been published, and Mr. J. B. Harrison, the Government Analyst, received by last mail from the author, Dr. Franz Benecke, a pamphlet on the subject of the sugar cane seeding in Java, giving a history of the subject as regards what has been written thereon by botanists and others in the past, and detailing fully Dr. Soltwedel's experimental researches. The paper which appeared in these columns in April last is referred to, and the work of Messrs. Harrison and Bovell in Barbados. But Dr. Soltwedel's investigations appear to have been carried on before the publication of the Harrison-Bovell discovery of seedlings, and are therefore entitled to the credit of originality. The paper is most excellently illustrated with a large series of drawings of the spikelets, flower, and its various parts, mature seeds, seed in various stages of germination, and all the stages of the young plant's development, till it has reached a few inches high, and buds are sprouting from the base. The figures agree with and confirm the observations made in my own numerous examinations and dissections, and with those made prior to mine by Messrs. Harrison and Bovell. Unfortunately, such is the poverty of these lands in art and art resources compared to Java, we were unable to get drawings and engravings made, and these of Dr. Benicke are therefore the first that have been published. Their general accuracy, great detail, and excellency of drawing give them special value. Though from what has been published in these columns during the past two years my readers are conversant with the subject and its potential importance, it is of so much interest to the planting community that I am endeavoring to get a translation made to republish here. Owing, however, to the impossibility of getting the figures engraved in the colony, they, unfortunately, cannot be reproduced.—*Demerara Argosy, April 26.*

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HOW SHALL WE PRESERVE OUR FORESTS?

The rapidity with which the forests all over the Union are disappearing has, since the last decade, awakened a remarkable interest in regard to the preservation of the Adirondack forests in New York State, the economic value of these mountain forests being to the country in general even of much higher value than is the material to their private owners. While formerly public opinion was opposed to the state's holding more land than was necessary for governmental purposes, and therefore the state always endeavored to rid itself in the swiftest way possible of any woodland which came into its possession by non-payment of taxes, there is now a movement on foot looking for a vast increase of the one million acres of woodlands comprising the state forest preserve for the purpose of establishing a grand state park.

This park idea, although calculated to preserve our state forests, is not conducive toward awakening a general interest in behalf of forestry with the people; and this is an essential point if we are to succeed in preserving our forestal wealth. Forestry is an industry contemplating the continuous production of wood to furnish material for the supply of fuel, timber and lumber to the people; and the latter would not tolerate an expense of several millions of dollars for the enlargement of our forest preserve, which up to the present date has only served either to increase the number and extent of denuded woodlands in the Adirondacks or the places where trees may go to rot undisturbed. The tax-paying people would not consent to such a large expenditure unless convinced that this vast forest land should serve, besides its economical purposes, also its natural destination of furnishing a continual supply of wood. This object is not reached either by a park management or by a provision as contained in Sec. 8 of the Forestry Act (May 15th, 1885), "that the State Forest Preserve shall be forever kept as wild forest lands," for in each case there could be no tree cut unless it was over-mature and unable to contribute to the embellishment of the landscape, and then the trees would be without any value to the trade.

At a dinner arranged recently in New York city, to bring the lumbermen of New York state together and give them an opportunity to become acquainted with one another, ex-Senator Warner Miller referred to the present movement for the preservation of the Adironback forests, and condensed the essence of his speech in the concluding words: "The forests should be used, but not abused."

This view is the only correct one of the subject matter.

Forest preservation in the sense of keeping forests intact and preventing the utilization of their material is practiced nowhere; we ought to use the word "reservation" instead, as this conveys the proper meaning of what we express with the word preservation—that is, the reservation of a certain area solely for the purpose of being kept forever as a wooded tract of land. This means certainly protection against willful damage and accidents; but also such a management as to sustain a continuous forest-growth on the woodlands, and to replant or to reseed denuded tracts within them. These are the two main principles upon which systematic (or scientific) forestry is based; and we have no reason to eschew them, but every reason to render them serviceable to our conditions. Led by these principles we can always manage forests so as to satisfy, according to the facilities afforded by the soil and climate, the wants of the people, not only in obtaining the material of forest growth, but also in securing the opportunities which are given through mountain forests to pleasure and health seekers; in other words, properly managed forests, besides giving inexpressible charms and attractions to the country, and thereby exercising a refining influence upon the moral and esthetical sentiments of the people in general, serve as a resort for invalids, owing to the air, which imparts vigor to the recuperative powers of those who are weak of nerve and broken in health.

The erroneous conception of what forest preservation means and the prevention of the utilization of the forest material has with us worked just adversely to the real conservation of the woods, for over-mature trees, covering sometimes hundreds of acres, are thrown down by the force of strong winds, piled up and massed together so as to completely bar the passage, creating fire traps of the worst kind, and these when kindled willfully or accidentally extend to the surrounding wood plots, and destroy them also. Still worse are the consequences when steep hillsides become denuded of forest growth. Here the adhesion of the regularly thin soil to the mountain rock is perfected by the roots of the trees. As soon as these disappear without being replanted, landslides will be caused through rainstorms or other superabundance of water, which leave behind them not only infertile wastes, but perfectly destroy the lower places, where they had their sand and gravel settled down, while the fertile ingredients, being made soluble, were washed into the streams.

These are only a few cases of the many in which mountain forests, when only kept intact, will be subject to destruction without having furnished the least utilization of their material. If we are to really preserve forests there is no other means left but to manage them in a systematic business way. To properly preserve them they should receive just the same attention as is bestowed upon well-managed forests. They have, 1. To be guarded by officers from the encroachment of persons who have no right in them, and from abuses and infractions of the law by those who have. 2. To be protected from injury of various kinds, as, for instance, from fires or other elementary damage, from destruction caused by pasturing farm animals or game. and from injuries caused by insects. 3. In a properly conducted forest preserve there must be performed the following principal labors:

(*a*) Annual felling of mature, defective or dead trees and their transportation in such a way that no damage shall be done to young, growing trees. (*b*) The periodical thinning out of places where the trees have sprung up too thickly, in order to effect a more vigorous growth to the remaining trees. At the same time the worthless varieties of trees are cleared out to give room for the more valuable. (*c*) Vacant spots have to be filled out by natural re-production of the trees, either by shoots, sprouts and layers from the stumps and roots, or by the natural sowing of the seed of the parent trees: or, finally, if in the way mentioned a reproduction of the trees is not practicable, artificial re-planting, such as sowing the seed or planting young trees, raised in forest nurseries, has to be resorted to, although this should be done as rarely as possible.

It seems, however, as if the private owners of forests in the Adirondack Mountains are now awakening to the fact that their own best interests require the introduction of systematic management of their possessions, and that the policy followed by them up to the present time, will finally end in the total destruction of their woods; for a correspondent of one of the leading New-York morning papers, which has exhibited much zeal in stopping the ravages going on in the Adirondacks, writes from Essex County on March 10th, after having demonstrated the profitableness of skilled forest culture in the woodlands there, that "even the people up here are beginning to understand that forestry may be made a profitable business, and have made recent applications to the Land Office to redeem tracts avowedly with this intention in view."—*Corr. Independent.*

SOME RESULTS OF RECIPROCITY.

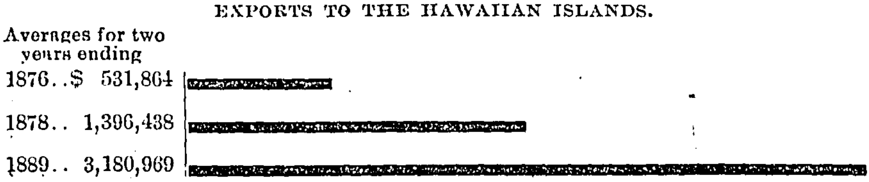
All advocates of reciprocity treaties, from Secretary Blaine down, have an excellent illustration for their arguments ready to their hand in the operation of the treaty with the Hawaiian Islands during the past fourteen years. One of the principal ends to be reached through such arrangements is an extension of the country's export trade. On the limited scale afforded by the Hawaiian treaty this result has followed in a marked degree. The convention became practically operative September 1, 1876. In the next two years, in comparison with the two years preceding, our exports to the islands more than doubled, and they have now increased sixfold. The causes for this remarkable growth are to be found wholly in the existing commercial arrangement. There is no other possible explanation. Here are the figures for domestic merchandise :

EXPORTS TO THE HAWAIIAN ISLANDS.

1875	$ 472,650
1876	591,077
Average	$ 531,864
1877	$1,109,429
1878	1,683,446
Average	$1,396,438
1888	3,025,898
1889	3,336,040
Average	$3,180,969

This noteworthy exhibit appears yet more clearly in the following graphic showing :

EXPORTS TO THE HAWAIIAN ISLANDS.



Our exports to the islands, of course, go to pay for imports therefrom. A corresponding increase will accordingly be found in the importations. In 1877 we imported from Hawaii $2,550,335 worth of merchandise, ten months of that year being under the treaty. By the fiscal year 1888 this total had increased to $11,060,379, while last year the aggregate was $12,847,740. Brown sugar and rice comprise the greater part of the imports. Our exports cover a rather wide range of agricultural products and manufactures. The values of the principal articles exported and imported, respectively, last year and the year before appear in the tables below:

EXPORTS OF DOMESTIC MERCHANDISE.

	1888.	1889.
Barley	$106,140	$117,152
Flour	178,034	224,224
Food preparations from breadstuffs	104,744	95,367
Cotton goods	293,986	345,489
Miscellaneous iron manufactures	128,600	139,093
Boots and shoes	52,737	102,604
Refined sugar	65,797	59,276
Boards and planks	158,845	164,261

IMPORTS OF MERCHANDISE.

	1888.	1889.
Under the treaty:		
Rice	$ 551,257	$ 494,166
Molasses	6,418	6,148
Brown sugar	10,260,048	12,078,518
Other merchandise	762	9,761
Totals	$10,818,434	$12,588,593
Bananas	62,608	90,982
Hides and skins	92,537	95,577

For most of the leading commodities exported, it will be seen, an increase over 1888 was recorded last year. The increase in imports occurred in the item of brown sugar, where the augmentation was rather extraordinary. Some interest attaches to the fact that while brown sugar is imported from the Hawaiian Islands, a moderate quantity of refined sugar is in turn exported to them.

American vessels make a fine showing in the Hawaiian Island trade. This is almost the only part of the world where our flag plays a conspicuous part in commerce. Of last year's exports, $2,173,692 worth, or nearly two-thirds, went out in American ships, and only $1,162,000 in foreign bottoms. In like manner $10,777,839 worth of imports, or over five-sixths of the total arrived in American vessels, and only $2,069,901 worth, or less than one-sixth, in foreign vessels.

American capital chiefly is employed in the industrial and commercial affairs of the Hawaiian Islands. The investment is due wholly to the exemption of Hawaiian Island sugar from duties. Commercially, indeed, Hawaii, on account of the treaty, is almost literally a dependency of the United States. Without much question the ratification of General Grant's treaty with Mexico would have had similar results, and the same thing is to be anticipated from any future arrangements that may be entered into with the countries of South America. —*Bradstreets'*.

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ESSAY ON THE SOFT-SHELLED WALNUT.

BY G. W. FORD.

READ BEFORE THE FRUIT GROWERS' ASSOCIATION OF LOS ANGELES.

The Fresno, (Cal.) *Expositor* has the following suggestions to offer on the black walnut: There is money in growing the black walnut, and the people of this valley should realize the fact. True, the walnut will not thrive on the hot, dry plains, but where there is sufficient moisture in the atmosphere to render the air humid, as in the case with our irrigated lands, it will do well. The walnut tree is gradually growing scarcer throughout the older States, and the value of its wood is constantly enhancing. It will, of course, take many years for a walnut grove to become valuable as timber, but during the time it is approaching that period it can be counted on for a regular yield of nuts, that will always find a ready sale. There are many acres of land in the river bottoms and along the water-course of this valley where the cultivation of other trees would be profitable, where the walnut might be grown with success. As showing the value of the black walnut, a grove of walnut trees—one hundred and twenty in number—were sold at Delphi, Indiana, a few weeks ago for $10,000, while last year on the same farm, a grove of eighty-nine trees was sold for $6800. The *Expositor* would suggest the planting of a few walnut trees about every farmhouse, first for shade, secondly for its fruit, and third for an investment that will surely yield a handsome future return.

THE SOFT-SHELLED WALNUT.

The European walnut (*juglans regia*, Latin ; *noyer*, French ; *noce*, Italian ; *nogal*, Spanish) is one of our finest growing trees, and after thorough test has been found to be at home in the State of California, especially in our rich valleys, between the coast and the range of mountains. Of this most desirable and profitable nut there are many varieties, some of late introduction from France, two varieties originating in the orchard of Joseph Sexton, Esq., at Santa Barbara. supposed to have come from seed brought from a point in South America, and besides the English or Madeira nut, known best of all to us, as it was the first to be propagated and raised in our orchards. The soft-shelled walnut (one of Mr. Sexton's varieties) is considered by all who have had experience with it to have all the points essential for a first-class walnut, and on suitable land the most profitable orchard to plant. I have in my orchard eight varieties imported from France, which, in my estimation are entirely worthless, all being of a dwarfish nature, and after being planted in the orchard for seven years, have not made as large a growth as some of my three-year-old soft-shells. I first procured my seed from Mr. Sexton, and in examining them found two varieties, a soft paper shell, or rather a thin and a soft shell. This paper shell, as it is termed, is a finely flavored walnut, but it is not by any means a good grower, and, besides, the nuts are small and the shell extremely soft, which consequently makes it difficult to ship any distance. For family use, on a shall lot and for close planting, the paper shell will give satisfaction, and those who plant trees of this variety will certainly not go amiss. The larger and finer variety is what I term the "improved" soft-shell walnut, as in selecting the nuts for planting I pick out the largest nuts and only those that come from the largest growing trees in my orchard. My improved soft-shell nuts took the premium at the last Downey Fair. I had about one-third of a bushel there, and the nuts averaged twenty-four to the pound. I plant my walnuts in the nursery rows four feet apart by one foot apart in the row, and do not believe in planting nursery stock of any kind too close —certainly, cheaper trees can be grown by that method, but I have yet to find a stunted tree that ever gave satisfaction when placed in an orchard.

I want one-year-old walnut trees, one to three feet, two-year-olds four to six feet, the three-year-olds seven to nine feet—all of the above to be good stalky trees. The root of a three-year-old walnut is but little longer than a two-year-old, though it is certainly larger. Of course the root will grow in proportion to the top of the tree, for when a walnut commences to branch, which is about four years from the seed, then the root will commence to throw out laterals. In planting the trees in an orchard first of all plow the ground deep, and then go over it with a harrow or pulverizer. Forty feet apart, giving twenty-seven trees to the acre, is the best distance to plant the improved soft-shell walnut. Dig large, deep holes, plant two or three inches deeper than the trees grew in the nursery, lean them to the prevailing summer winds, and you will not have to stake your trees to make them grow straight Press the soil firmly around the roots, and if not very moist give each tree five or ten gallons of water, which is sufficient to settle the soil firmly around the roots. Cultivate your orchard to the depth of four or five inches. If your soil is moist enough to keep the tree in good growing condition during the summer months, then irrigation is not necessary; but to make a first class walnut in size and in the fullness of kernel, if the ground is not naturally moist enough, then artificial means will have to be adopted. I don't think small grain should be planted in a walnut or any other orchard. If corn is grown, leave eight feet on each side of your trees clear, though I am of opinion that potatoes, peanuts and beans are less injurious to the trees. Pruning the walnut is of but little trouble, and can be done by any one. When planting do not cut the top off, as is done on other deciduous trees, but leave the main trunk for the center. Prune up to three or four feet (not too high), for the bark of a walnut tree is easily sunburned, so it is necessary for the foliage and lower branches to shade the trunk. If the lower limbs extend outward and are in the way of the cultivator, tie them up to the trunk, for by so doing you can train the lower branches upward so as to cultivate close to the tree, and when the orchard comes into bearing, the limbs growing upward will not bend down to the ground with the fruit, so you can't get within twenty feet of them with a cultivator.

My improved soft-shell walnut commenced to bear at four years from the seed; at six years old my trees averaged fifty pounds of nuts to the tree, while some trees went as high as seventy-five. At seven years they averaged ninety-six pounds, and at eight years old averaged as high as 125 pounds, while some of the largest trees bore 150 pounds of the finest walnuts I have ever seen. I have never sold the nuts for less than ten cents per pound, and from that to fifteen cents. Here are a few figures which, no doubt will be of interest to many contemplating planting walnuts. For instance, take an eight-year-old improved soft-shell walnut orchard, which will average at least 100 pounds to the tree, at ten cents a pound, which gives $10 to a tree, or $270 to the acre. Even at five cents per pound, $135 would be the gross returns, which is good interest on $1,000 per acre, after all expenses for cultivating, irrigating, etc., are paid. The above figures speak for themselves as to the paying qualities of this nut. I have a few English or Madeira nut trees on my place, fourteen years from the seed, receiving the same care as my eight-year-old soft-shell orchard, but they do not bear at the present time one-third of the quantity of nuts that my soft-shell produce, besides obtaining a smaller price (about five or six cents a pound), and the trees though nearly twice the age, are not any larger. It is a well known fact, not only to fruit growers, but to merchants, that a Madeira nut gets rancid if kept a year, though all possible care may be taken of them. I have kept the improved soft-shell walnut in good condition for two years, while a friend of mine, Judge Bacon, of Capistrano, tells me he has kept them in first class condition for three years. The above points are of interest to us, for, if we have the soft-shell, we don't have to crowd it off on an overstocked market. In planting walnut trees forty feet apart it only gives twenty-seven trees to the acre, and if a man is not satisfied with this small amount of trees, then let him put orange trees between them. Budded varieties are preferable for quick returns.

Plant an orange tree in the centre of every four walnuts, which gives an equal number of walnuts and oranges, twenty-seven of each kind to the acre. If three-year-old walnuts are planted, an orchard like this will give the owner handsome returns in three years from planting, if properly taken care of. The walnut, being covered with heavy foliage in summer, protects the oranges from the cool coast winds which prevail at that season; and when the cool coast breezes have stopped blowing in the winter, then the foliage is off the walnut tree, which gives the sun full play among the fast ripening oranges. I believe an orchard like this could stand twenty-five or thirty years without having to remove any of the trees, and am of the opinion that orange trees will produce more and better fruit if planted in this way, if near the coast, for the cool coast wind in summer is not at all beneficial to the orange. The only good oranges I have seen grown near the coast, were all well protected with wind-breaks, and oranges grown in this way will compare favorably with the inland fruit. Now, gentlemen, in making the above remarks, I should say, before you plant a walnut orchard see that you have good, rich, deep, valley soil, with first class water facilities or do not expect such promising returns as I or my neighbors in Orange county have had. I don't recommend planting a walnut orchard if you have poor soil, but something that will come off the ground early in the season. Certainly, your land need not be anything extra, but I say that almost on any land where corn can be grown without irrigation in this State, especially in the southern part, a good quality of walnut can be raised without artificial means of watering. In winding up this short paper on the "Culture of the Soft-shell Walnut," I will say, if any fruit or walnut grower doubts my words, I extend to him an invitation to come down to our thriving little capital of the new-born county, and I shall show him there an orchard which would satisfy the most sceptical that a soft-shell walnut orchard is a paying investment.

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We find that even some of our prominent horticulturists are afraid of planting nut trees on account of the alleged difficulty met with in transplanting. We can hardly state emphatically enough that this is a bugbear. When the trees are properly grown at the nursery, and transplanted when one year from the nut—as they should be—they can be handled as safely as any of our common fruit trees. Thousands were transplanted at the nursery here last spring with hardly a loss worth mentioning.—*Orchard and Garden.*

SEREH—THE JAVA CANE DISEASE.

[From the Demerara *Argosy*, April 26th.]

Dr. Benicke, of Java has sent Mr. Harrison a pamphlet by the late Dr. Soltwedel on the sugarcane disease in Java, called *Sereh*, to which I have alluded before in these columns. This I hope to get translated too, and to reproduce such parts as may be of information and use to us in this colony. The pamphlets were accompanied by a letter describing the characteristics of *Sereh*, which, as the first authentic account we have received in this colony of that disease, I publish for general information. Evidently the term covers not only real disease, but every form of attack or affection to which the sugarcane is liable.

SAMARANG, February 2d, 1890.

TO HERR PROFESSOR HARRISON, Barbados :

Highly Esteemed Professor:—I beg leave to send you two copies of my treatise "About Sugarcane from Seed," of which kindly accept one copy and have the goodness to transmit the other to Mr. Bovell.

It has been my intention for a long time to write to you, in order to know from you, whether there occurs in Barbados a similar disease of the sugarcane to what we have here. They call it here "The Sereh" disease. To give a definition of the same is not possible for me. The position which I take up on this question in the meanwhile is shown in my treatise.

I want to enumerate in the following notes what are all considered symptoms of the "Sereh" without, however, wishing to maintain that all these are really symptoms of the "Sereh." They really call now every diseased appearance of the sugarcane "Sereh," and cause thereby the greatest confusion. The diseased appearances, which may be observed here on the *Saccharum officinarum*, are among others, the following :

1. Low (often only three* to four decimeter high), shrubby growth, *i.e.*, many shoots crowded together. Therewith the leaves are oblong and at one time narrow, at another out of all proportion broad. From this shrub-shape with very narrow leaves comes the derivation of the name, as in that case our

* 12 to 16 inches.

cane resembles the *Andropogon Schoenanthus*, the Javanese name for which is "Sereh."

2. Fan-shaped arrangement (position) of leaves, arising from the shortening of the internodes.

3. In the case of severely sereh-sick plants, which are only a few decimeters high, the internodes are occasionally only ½† cmtr. long, more particularly are the knots (nodes) tinted strongly red, so as to obtain on the longitudinal section the appearance of a ladder with red rungs.

4. Formation of numerous aerial roots.

5. These roots are unable to pierce through the leaf-sheath, but bend frequently inside of same.

6. The fibrovascular bundles of the stem are tinted strongly red.

7. Numerous super-terraneous outbranchings.

8. Sheaths and root-buds below these are dyed vermilion; frequently also the stem itself is.‡

9. Formation of wax on stem is "said" *(dicitur)* not to occur.

10. Sticking together of the leaf-sheath and the stalk.

11. Growing part of the stalk is frequently dyed *highly* red.

12. Ratoons (called here "Bibit"), rot in the ground and become right through red (rot).

14. Accumulation of secondary organisms, for instance, many insects, fungi, etc., etc.

It would be of great value to me to hear from you which of the enumerated disease symptoms occur also in Barbados; particularly would I like to know *whether the growing parts of the stalk be colorless or strongly red!!*

Mutual interchange may perhaps benefit the agriculture there and here.

The "Sereh" disease costs Java annually many millions. Should it extend further it would threaten to destroy our entire industry.

I send for you also a copy of the pamphlet "The Sereh Disease," by Dr. Soltwedel, our late Director, who unfortunately died here suddenly on the 17th December, 1889. I remark, in

† ⅕ to ⅖ inch.

‡ The red-edged color I take to be normal, when the roots are exposed to the light.

reference to the pamphlet, that I cannot share the views of Dr. Soltwedel. It would be interesting to hear whether *Heterodera radicecola*§ is also indigenous to Barbados, and whether it attacks the sugarcane.

I would be greatly obliged to you, were you to have the kindness of answering me very soon, and were we to remain in mutual interchange of ideas.

Receive these salutations from your antipode, in high consideration. DR. F. BENECKE,

For the Experimental Station at Samarang.

Address: Proefstation de Samarang, Java, Asia.

MANGO GROWING IN FLORIDA.

BY GEORGE E. WALSH, IN N. Y. INDEPENDENT.

The mango tree *(Mangifera indica)* is a tropical plant that is extensively cultivated in the warmer countries of Asia and Europe. In Persia and India, and on the borders of the Mediterranean Sea, it flourishes abundantly, where it is eaten by the natives with great relish. It makes a very agreeable dessert, and when pickled it forms a staple article of the commerce of those regions. The Hindus consider the wood of the trees of sacred value, and along with the sandal wood of that region they use it for cremation.

Of late years, however, the mango trees have been extensively cultivated in the tropical and sub-tropical regions of the two Americas, where they have already attained an important rank in the commerce of the countries. Heretofore the mango fruits have been imported largely to the United States from Europe and Asia, or from the countries south of us: but since the soil and climate of the Florida Peninsula have been found to be peculiarly adapted to the growth and cultivation of the trees the home trade in the preserves has gradually crowded out the foreign. In the tropical climate of Florida the trees sometimes attain a height of from thirty to forty feet, and produce fruit abundantly. Cultivation has done wonders for this fruit. Although not belonging to the same class as the *Spondias magnifera*, or wild mango, as it is called in India, and with which it is often confused, the wild variety is so different from

§ A nematoid worm, mentioned in a previous issue of these columns.—ED.

the cultivated that one is surprised at the important results obtained from culture and selection.

There are many varieties of mango trees, even in Florida; and the first differs in size and flavor, ranging from the size of a plum to that of a large apple. The wild varieties, or those that have degenerated from lack of culture, produce fruits that are sour and stringy, with a disagreable flavor of turpentine and gallic acid about them. They are unfit to eat, and are of little or no value. From these, however, through careful cultivation and selection, fruits of a sweet and luscious nature have been raised that must appeal to the palate of all. The cultivated varieties average the size of a large egg, with a greenish yellow on the outside, and a bright yellow inside. The pulp is always more or less fibrous and stringy, but not so as to be disagreeable. It is best to pare the fruits before eating. A large, oblong seed is inside each fruit, which, in times of scarcity is eaten by the natives in Asia. When properly ripened the fruits are not only delicious to the taste, and valuable for preserves, but the flesh and kernels are of great medicinal value. Those suffering from fevers are greatly benefitted by eating one or two mango fruits every day, and, like limes, they frequently act as preventatives to malaria.

The mango trees are usually propagated by grafts, or by layering, although they come into bearing five years from planting the seeds. When the trees are fully grown they greatly resemble orange trees in size and shape, producing a dense, spreading and glossy foliage, which makes a beautiful appearance in the garden or around the dwelling house. They should not be planted too close together, the average distance being about the same as for oranges. The trees are at home on the sandy soils of South Florida, where they are now being grown in more or less abundance. There are not yet sufficient groves planted to make the industry a thriving and profitable one. The trees produce on the average from fifteen hundred to two thousand mangoes each, which sell in Southern markets from one to three dollars per hundred. If they were raised in sufficient quantities and introduced properly in our Northern markets the demand for them would increase, and some handsome prices be obtained for them. But like the grape fruit they have been so slowly introduced that many Northern people still know nothing about them. Grape fruits are gradually working into public favor, and every year the number of barrels of these fruits sent North is increasing. There is no doubt but mangoes could be brought into similar favor with a little energy and persistence. Fruit growers make a mistake when they imagine that Florida is designed solely for orange growing. She can produce a variety of tropical and sub-tropical fruits that must in time become the chief source of wealth of the State. If the markets are annually flooded with oranges let horticulturists take the hint, and devote more time and space to other fruits that will probably be just as profitable as the golden orange.

There are a great many varieties of mangoes in Florida, but the Persian or Eastern variety is probably the most desirable. One should, however, make a point to cultivate two or three varieties, for some of the largest and best are small bearers, while those producing small but good fruits are very prolific.

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CALIFORNIA RAISINS.

Raisins are the leading fruit product of the San Joaquin valley of California, as oranges are of the upper Santa Ana valley. The different parts of the State have climatic and other conditions which insure a great variety of crops, but not all in the same place. Oranges can be raised in the Sierra Nevada foot hills, but they have reached no great importance as a commercial crop outside of a comparatively limited territory within fifty miles of Los Angeles. Raisins, in like manner, are a market crop at Riverside, and yet quite another portion of tue State, with Fresno for its center, is admitted to be the real seat of the raisin growing industry. At Fresno again the raisin grapes completely overshadow the table grapes. The latter grow well enough, but they have yet to become a staple crop. The Fresno farmers attribute the backwardness of this branch of horticulture to excessive freight rates. In central California the Southern Pacific Railroad has an absolute monopoly. Southern California enjoys the advantages of competition. Whatever the cause, however, the fresh fruit, except oranges and lemons, which reaches the east from California is shipped principally from the more northern counties.

The best wines are also made well toward the north. San Jose lays claim to distinction as the headquarters of the fruit-canning business. In mercantile circles, of course, these and numerous other distinctions are known of and appreciated. The average traveler, on the other hand, has to learn by experience that "California" is a very comprehensive term, and that traversing the State from south to north he must go through a region that stretches as far as from Georgia to Massachusetts, and yields as wide a range of products.

On some accounts the raisin industry is the prettiest of all the horticultural pursuits of the Pacific coast. It is also among the more remunerative. Nature not only produces but cures the grape. The growth of the industry at Fresno, in the San Joaquin valley and in that vicinity, has been phenominal. Fresno county furnishes over half of the entire raisin crop of California, and its fruit is as well known and liked in Portland, Me., as in San Francisco. No longer ago than 1882 the output of Fresno county was only 4,000 twenty-pound boxes. Seven years later it was 560,000 boxes. The most remarkable increase was from 1886 to 1887. In the latter year the vines planted—when the possibilities of the business first began to attract attention—came into bearing, and the output stood at 350,000 boxes, against 170,000 the year before, a gain of over 100 per cent. The total product of the State in 1888 was 1,034,000 boxes. Of this great quantity the Fresno district furnished 534,000 boxes, the Riverside and San Bernardino districts 290,000 boxes, and the rest of the State, in much smaller proportions, the remainder. There are symptoms of disease among the vines at Riverside. Fresno as yet is wholly free from them, and the growers there believe that the peculiarities of their climate guarantee them immunity. It remains to be seen, however, what will be the effect of age. The Fresno vineyards are still, without exception, young and vigorous.

Nearly 40,000 acres of raisin grape vines are now growing in Fresno county. Almost all of the stand is of the muscatel or muscat variety. The growth of the vineyards in size and value during the past two or three years has been very great. At the beginning of 1889 there were about 15,000 acres of grape vines, of which 12,000 acres were muscatels. The planting during the following season amounted to not less than

10,000 or 11,000 acres, and the present winter has seen even a greater addition. The important discovery has been made that irrigation is a benefit to the vines and not a detriment, as has been commonly supposed. Fresno county is thus well situated for good results. There is a conspicuous absence of spring frosts and the autumn rains usually come late. The freedom of that district from fogs also insures an early crop. With improved methods in the care of the vineyards, experience, and a constantly widening market, the California producers have no fear of an over-supply. Their raisins have been sold during the past year in London, though of course, in little more than an experimental way. San Francisco and Chicago handle the bulk of the crop.

Doubtless it is not generally known that raisins of California growth are cured wholly in the sun. No artificial means whatever are employed. Sun drying is made possible by the climatic conditions. Rain never falls during the summer or early autumn, and the nights are as dry as the days. The clusters of grapes when picked are accordingly laid out in the sun on open trays for about two weeks, being turned once, and at the end of the proper period the grapes are raisins. Since, however, they may dry unevenly, on account of differences of size or for other reasons, they are packed together for a brief "sweating" before being put up for the market. As a rule the grower sells directly to local packers, and five cents a pound is considered a remunerative price. After the packer has sorted the raisins and put them into boxes the average wholesale price at Fresno may be called ten cents a pound. Special brands, raisins laid into the boxes separately in rows or geometrical figures, small cartons, etc., of course command fancy prices in California as well as elsewhere. At ten cents a pound, or $2 a box, the 560,000 boxes of Fresno raisins brought in to the packers last year over $1,100,000, of which amount the growers received about one-half. Fabulous stories are told of the returns per acre, With the highest culture, under the longest experience and greatest skill, $400 an acre has been realized, and $250 an acre is said to be not uncommon. But it must be remembered that the instances of partial failure do not get into print. The raisin has been called the "poor man's friend," but rather fantastically, for no poor man can get the indispensable start in the best and safest localities. Wealth is not required, but nothing can be done without a moderate amount of capital.—*Bradstreets'*

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PLANT NUTRITION.

The proper conception of what a plant is includes the idea of an organism that constantly takes in food and gives off waste. One who has the care of animals recognizes that they need food of a definite kind and quantity; but it is seldom considered that precisely the same is true for plants. It is because plants silently and invisibly appropriate for their food the common elements of the inorganic world, while animals seem to eagerly contend for the higher products of organic nature, that we overlook the essential identity, in regard to the function of nutrition, between the two great families of nature.

A knowledge of the facts and principles of plant nutrition is of interest and often of practical value to every one who cultivates plants, whether in the field, the vegetable garden or the flower garden. We may consider (1) what constitutes the food of plants, and (2) what is known about the processes by which the plant utilizes its food for growth.

A plant gets a part of its food from the air and a part from the soil. This fact explains the broad features of form in plants; for the ramifications of the roots and their ultimate terminations in rootlets and root-hairs are only to increase the absorbing surface for soil food; and the branchings and re-branchings of the limbs are only to afford place for multitudinous leaves, a part of whose work is the absorbing of air food. The great task which nature imposes upon the plant is to get food for growth and for bearing fruit and seed; and to do this the plant stretches out a thousand arms to soil and air.

In order to find out what substances the plant takes from earth and air, it is needful to ascertain what chemical elements and compounds enter into the composition of the plant-body. The familiar fact that any plant pulled up by the roots and left to the sun loses greatly in weight by dessication, shows that water is the most abundant constituent of plant tissues.

A comparison of the weight of the green plant with that of the dried one shows that, for most herbaceous plants, water forms seventy-five per cent of its substance. In aquatic plants the percentage is much higher, being sometimes ninety-five ; while in full grown trees, as the maple, oak, etc., the proportion of water may be no more than forty per cent.

If what remains of the plant after dessication be burned, the greater part will pass off as products of combustion. The chief of these are carbonic acid gas and the vapor of water, formed by the union of carbon of the plant and hydrogen of the plant, respectively, with oxygen of the air. Analysis of the other gaseous products of combustion shows that the plant gives off in burning, besides carbon and hydrogen also nitrogen and oxygen. These four elements, then, are present in the living plant; and the compounds which they form, as shown in the fact of their ready combustion, constitute the organic matter of the plant in distinction from the mineral matter,

This mineral matter remains behind when a plant is burned, as the ash. Analysis shows that it consists of the chemical elements, potassium, phosphorus, calcium, magnesium, sulphur and, usually, other elements.

Having thus noticed what are the ultimate material units of composition in the plant, we have next to consider in what combinations they exist in the living plants ; that is, what the chemical compounds of plant tissues are. But before going to the chemist for information upon this point, it will be useful to call to mind the fundamental fact about the structure of plant tissues, namely that they consist of cells. Any part of a living plant is made up of minute, sac-like, structural units called cells. The outer part or wall of the cell is firm and tough, the inner part soft and semi-fluid. Now as the living part of every plant consists of cells, and as all cells have substantially the make-up just named, our inquiry as to the chemical compounds found in plants is simplified by considering the composition of, first, the cell-wall ; and, second, the cell-contents.

In regard to the cell-wall only a word need be said. It consists of the compound cellulose, the chemical elements of which are carbon, hydrogen and oxygen.

The soft, jelly-like cell-contents is the substance which the biologist calls protoplasm. The chemist, upon analysis, finds in it several compounds, the essential ones of which are an albuminoid, composed of the elements carbon, hydrogen, oxygen, nitrogen and (usually) sulphur and phosphorus : and water, composed, as we know, of hydrogen and oxygen. But in the protoplasm—though forming no necessary part of it—are usually present several other compounds. These are fats, composed of the elements carbon, hydrogen and oxygen; starch, composed of the same three elements, but united in different proportions; and (if we are studying the cells of the green leaves or bark) chlorophyl, composed also of the same three elements, but with iron, and probably nitrogen, added.

The chief chemical compounds of plants are, then, an albuminoid (containing nitrogen), cellulose, starch, fats (all carbo-hydrates), chlorophyl and water. Besides these there are many others, sufficient mention of which will be in regard to the classes of organic substances to which they belong, as follows : 1. Carbo-hydrates—of the same chemical significance as those mentioned, such as sugar and inulin (like starch) and gums and resins (oils). 2. Acids, occurring in specialized parts of the plant as (in the fruit) malic acid of the apple, citric acid of the lemon, etc., and (in the bark) tannic acid of the oak and other trees. 3. Alkaloids, found chiefly in the seeds and bark, as morphia, of the poppy, cinchona from Peruvian bark, etc.

We are now in a position to return to the more interesting question of what constitutes the food of plants. It has already been intimated that their food consists only of inorganic matter; but it is to be understood that this statement applies only to chlorophyl-bearing plants and that even among these there are exceptions—plants that partially evade the rule of self-labor that nature seems plainly to have intended for all that bear green leaves. Let us observe, first, that all plants which are destitute of chlorophyl, or the green coloring matter live on organic food, just as animals do. This is true for all fungi, as molds, toad-stools, etc., which derive nourishment from organic bodies, animal or vegetable, undergoing decomposition. Molds, it will be remembered, grow on such substances as stale bread, old leather, etc. : toad-stools grow on decaying logs and stumps: mushrooms in soils containing decomposing animal matter. All plants which gain sustenance in this way are called saprophytes. Then there are the true parasites, a familiar example of which is the Dodder, which like the saprophytes, are destitute of chlorophyl, but differ from them in sustaining themselves upon the juices of living plants. Other plants are only partly parasitic, the mistletoe being an example. These, while they send their roots into the tissues of living plants and absorb their juices, yet possess green leaves and derive a part of their food from the air. Finally, a few plants are insectivorous, like the well known Venus' fly-trap and the sundew, seemingly deriving nourishment from the dissolved tissues of their winged prey; but these plants also possess chlorophyl-bearing leaves and doubtless depend chiefly upon aerial sources for food.

Having thus noticed those plants whose manner of nourishment is evidently adapted to peculiar conditions and must be regarded as aberrant, we return to ordinary green-leaved herbacious and arboreous plants. Their food consists of inorganic compounds, in the physical forms of gases and liquids. The gases are absorbed by the leaves and the liquids by the roots.

Of the gases that compose the atmosphere it is known that carbonic acid is constantly being taken in as food by the green leaves, and it seems probable that, in much less quantity, nitrogen is also absorbed. Both gases are indispensable elements of food for plants, but it is not certain that the plant is dependent upon free atmospheric nitrogen. It may be able to get a sufficient supply of this element from nitrate salts taken in as solutions through the roots. It is known that oxygen also is withdrawn from the atmosphere by the plant, but in much less relative quantity than the plant gives off to the atmosphere. It is now the opinion of students of plant physiology that oxygen is required by plants just as by animals—to carry on respiration, or the oxidation of wasting tissues. From the fact that during the day, when exposed to sunlight, plants constantly give off oxygen, it has been overlooked, until recently, that they require this gas for the oxidizing of waste, just as animals do.

The food taken in through the roots consists of water and of salts in solution. Water from the soil, like carbonic acid from the air, is constantly being utilized as food, and these two, in fact, constitute the chief substances of nourishment for the plant. But pure water is not enough ; there must be dissolved in it salts derived from the soil. Of these salts, such as contain potassium, sulphur, iron and phosphorus are indispensable for the life of any green plant. Most plants, including the common cultivated field plants, require in addition magnesium, sodium, calcium and silicon. All these elements are present in ordinary soils, and are supplied to the plant in the form of salts dissolved in the water of the soil. These salts, according to the characteristic elements of their composition, are the nitrates, carbonates, sulphates, silicates, phosphates, etc.

The remaining inquiry, how the plant uses the raw materials of the inorganic compounds for food for animals and for man, will be considered in another paper.

We have seen that a plant puts forth its green leaves in the air and shoots its roots into the soil in order to appropriate for its food the materials of the inorganic world. While quite a variety of compounds are needed, it is to be observed that all are present in the ordinary environment of the plant and that the most important ones, such as every kind of green plant stands in constant need of, are the simplest and most abundant substances of inorganic nature, namely, carbonic acid gas and water. We have now to consider how, out of the simplest, most inert forms of matter, the plant builds up complex organic compounds to serve as food for the animal creation and for man.

This work is done chiefly in the leaves. The green leaves are laboratories in which take place processes in constructive chemistry by which the gases, the water and the dissolved salts are built up into carbo-hydrate compounds. These compounds, which we have seen to be starch, sugar, fats, etc., are then available for food for the sustenance of the living cells and for the formation of new cells.

It is evident then, that in a general way, the leaves perform the same function in plants that the digestive organs do in animals. In the latter it is the work of these organs to take food matter, as received into the body, and so change its chemical and physical form that it can be absorbed by the blood-vessels and so supplied to the tissues for their nourishment. But while in the animal these elaborative changes take place in one specialized part of the body—the alimentary canal—in the plant they occur in many separate parts—in all of the hundreds of thousands of the green leaves. Some means is therefore necessary by which the food solutions absorbed by the terminal parts of the roots, namely the root hairs, shall be conveyed to the leaves.

This means, as that by which all movements of fluids in plants take place, is now considered to be purely physical; that is to say, neither a mechanism of any sort analagous to the heart in animals, nor any distinctly biological process is concerned in the circulation of the sap in plants; but it takes place under the same causes by which we observe fluids to move in non-living bodies. The physical cause thus assigned to account for all distributive movements of fluids in plants is *osmosis*, or the diffusion of liquids, separated by permeable partitions, until uniformly distributed throughout the mass.

To understand clearly the movements of fluids in plants, it is only necessary to conceive of the plant body as an aggregation of cells, all possessing an absorbing power for water. Some of these cells, having especially thin and permeable walls, grouped together in the form of delicate threads—the root hairs—are in direct contact with particles of soil penetrated with water. The cells, containing relatively less water than the particles of soil, absorb from them their water (taking in at the same time the earthly salts in solution) until an equilibrium is established. But this equilibrium is not for an instant maintained; for the cells lying next to those that have taken up water from the soil particles, absorb from the latter; they in turn give a part of the supply thus received to the cells lying next within, and so on until the whole aggregation of cells—that is, the plant body--is supplied.

This is the fundamental principle of sap circulation in plants. It is not, however, to be supposed that the passage of fluids from cell to cell takes place only because of difference in quantity of water present in adjoining cells. The same thing occurs if the difference relates to the density of the fluid constituent of the cells. It is thus evident that this principle explains the movement of fluids downward—from leaves to roots—as well as upward. If, as a result of the elaborative processes going on in the cells of the leaves, the fluid content becomes of greater density than that of the cells of the branches and roots, a distribution occurs to these parts of the plant. We shall notice, presently, the case of the distribution of a most common manufactured product of the leaves.

While *osmosis*, or the physical law of diffusion, is the fundamental cause of the circulation of fluids in plants, there are several subordinate factors, determining the activity of the process, which require mention. The first and most important of these is the evaporation of water from the leaves. Not a small part of the water withdrawn from the soil through the roots passes off to the atmosphere through the leaves. When it is considered what a great extent of surface the leaves expose to the sunlight and air, and, further, that by means of the *stomata*, or openings in the surface, the interior of the leaf is placed in communication with the air, it is seen how loss of water by evaporation is facilitated. And it is evident that the leaf-cells, thus losing a portion of their water, will immediately take up more from the cells below, and thus cause an upward movement of the sap throughout the plant.

A second factor is the expansion and contraction of the gases contained in the plant, either in solution or in the intercellular spaces, under changing temperatures. This produces an internal pressure which, varying in different parts of the plant, gives rise to a movement of the fluids. This is the probable explanation of the flow of sap from tapped trees, as the sugar maple, in the spring of the year, when the daily variation in temperature is greatest. It will be observed that this cause of the circulation of sap is active at the time of year when the one just noticed—evaporation from the leaves—is inoperative, and *vice versa*.

A third factor is the growth of the plant, or the formation of new cells—this going on constantly in all plants during the summer—for which materials are taken both from the soil and from cells already formed, thus occasioning varied movements of circulation.

Having learned by what means the raw materials of food are transplanted from the root-tips to the leaves, we have now to return to that part performed by these most important organs of vegetation. It will be helpful, again (remembering that the cell is the unit of the leaf), to limit our inquiry to the processes taking place in a single cell. Imagine, then, a bit of pure protoplasm, surrounded by a thin wall of cellulose, constituting a leaf cell in its primary stage. Exposed to the light of the sun in a short time a change would be noted; here and there minute spots of a green color would appear in the protoplasm. These green spots are chlorophyl-grains; they are simply minute portions of protoplasm stained green by the coloring matter. A little later another change might be noted. Within the chlorophyl grains small rounded bits of whitish solid matter would show themselves. These are starch grains. At first very minute, they gradually increase in size, and, in the course of a bright summer's day a considerable total quantity of starch, relative to the cell contents, as a whole, has been formed.

Let us suppose that the same cell is examined on the morning of the following day. It is likely that no starch will be found in it; but if its fluid part, or cell sap, were tested it would be found to contain sugar in solution. Sugar would also be found in the cells generally, including those of the stem and roots, where, on the previous day (we may suppose), none was present. Moreover, while no starch was present in the cells of the leaves, it is likely that it would be found in the cells of other parts, as the roots and stem. In a potato plant, for instance, starch would be found accumulated in outgrowths of the underground stem, called tubers. To complete a statement of the products which we may suppose to have been formed during the course of the twenty-four hours, we may notice the presence of fats, acids, alkaloids, etc., in various parts of the plant.

What, then, has occurred? Vegetable physiologists are not able to give a full, specific answer to this question; but it seems clear that the general nature of the processes, in its successive steps, is as follows: 1. The energy of the sunlight enables the protoplasm (the seat of life, or vital energy) to make chlorophyl, probably by the re-arrangement of a portion of its constituent chemical elements. This conclusion rests upon the fact that plants take on a green color only when exposed to light. 2. The chlorophyl grains, further using the energy of sunlight, cause the union of carbonic acid gas and water, taken in from the outside world into an organic compound that finally becomes starch. This opinion is based on the facts that these two substances are constantly appropriated by the leaves and are of such composition as to form starch by their union, with loss of free oxygen, which gas the leaves constantly give off when in the sunlight. 3. At the approach of night, when starch ceases to be formed, that accumulated during the day becomes converted into sugar, and in this form is distributed to all parts of the plant, some of it going to nourish the cells and another portion changing back to starch and becoming stored up, as in tubers, seeds, etc., for future use. The need of the transformation of the starch to sugar is in the fact that the latter is soluble and so can be conveyed in the circulation, while starch, being insoluble, must remain in one place. 4. A part of the sugar brought from the cells of the leaves is utilized (by what processes it is not known) to build up other compounds, the fats, acids, etc. Such of these compounds as contain nitrogen, including the alkaloids, are formed by the union of the elements of the sugar with a nitrogenous compound taken in with the soil.—*J. H. Stoller, in Independent.*

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YIELD OF JUICE FROM A TON OF CANE.

Some time since the Louisiana *Planter*, in reply to inquiries regarding the yield of sugar per ton of cane, had the following ;

"A first rate single mill can extract 60 per cent of juice from average cane ; say 1,200 pounds or 137 gallons of 8¾ pounds each. A good double mill will extract 70 per cent, or 1,400 pounds, or 160 gallons of juice. A first class double mill, with saturation between the mills will extract 75 per cent of juice, or 1,500 pounds per ton, or 171 gallons.

"These three grades of mills give us, then, respectively 137 gallons, 160 gallons and 171 gallons of juice. This juice commonly makes three-fourths of a pound of sugar of all kinds to the gallon ; it frequently makes seven-eighths of a pound to the gallon and should make one pound of sugar to the gallon every time."

The above reply is probably based on mill work in Louisiana. In these islands, our mills average better than that. Several of them turn out eighty per cent and over of juice with maceration ; and with diffusion the Kealia (Col. Spalding's) mill is obtaining over ninety per cent. The crop is not yet off, over 5,000 tons having been shipped to market, leaving from 1,800 to 2,000 tons yet to take off. When the season's work is completed, we hope to obtain statistics which will show beyond doubt that diffusion is the only proper way to treat cane juice, as it is the only recognized method of treating beet juice, and that at Kealia it has increased the outcome of sugar fully one-eighth, in this season's crop.

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SUGAR IN THE KISSIMMEE VALLEY, FLORIDA.

By W. W. James, the "Rambler."

Less than two years since Mr. Hamilton Disston, then, as now engaged in the colossal task of draining the Florida Everglades, had his attention drawn to the probability of making the manufacture of sugar in this State a signal success, on the basis of the self-evident proposition that it is much cheaper to convert raw material into forms of utility at the source of supply than away from it. This admits of no reasonable denial.

The matter having been duly considered, a stock company was formed to put the project into execution, the site definitely chosen, and not quite two years ago ground was broken for the great sugar refinery, the fame of which to-day has spread over the world.

LOCATION.

The spot selected was in the midst of a large tract of land, then covered with water, some three or four feet deep, under which was some of the finest alluvial soil in the world ; but, in order to utilize it the drainage of a vast area of land was necessary. The exact location of this land may be defined as follows : By going directly south from the town of Kissimmee, Osceola county, is the celebrated Lake Tohopekaliga, twenty-five miles long by an average of seven miles wide : due east of this is East Tohopekaliga lake—a name abbreviated simply into "East Lake"—an expanse of water twenty-five miles in circuit, and, opposite to the canal about to be described, six miles across. Between these two lakes, three and a half miles apart, and six miles south of Kissimmee is the center of the now famous industry. As the latter lake had a fall of some seven feet into the former, it is easy to perceive how the intermediate plateau or table-land thus submerged might be drained and converted into dry prairie.

A canal three and a half miles long, thirty-five feet wide and seventeen feet deep was dug, and the soil so long under three or four feet of water and saw-grass by at least four feet, making a permanent change in the water-level of East Lake of fully seven feet, some placing it at twelve, thus reclaiming from eight to nine thousand acres of land. On the southern bank of this main canal, two and a half miles from the larger and one mile from the smaller lake, the massive sugar mill stands—an impressive monument to the energy of its builders. Beyond this and seven miles further south is Narcoosee, the noted English colony. Here is the present terminus of the Sugar Belt Railway, which runs nearly a mile west of the refinery, and from that point is reached readily, by a tramway. It may be added here, as an explanatory remark, that Lake Tohopekaliga, the greater, is the head of steamboat navigation on the Kissimmee river, which, in turn, finds its way into Lake Okeechobee—the mysterious inland sea of South Florida, that, through the Caloosahatchee, wends its course into the Gulf of Mexico.

THE BUILDINGS.

Joined one with another, or rather aggregated with the main building, are the ensuing divisions, to wit: The main structure is 210x50 feet, the cane shed, for unloading cane, etc., is 115x75, the boiler sheds 90x70, warehouse (now under construction) 120x40 feet. Standing a little apart from this connected and compact group of structures is the scale shed 30x20, and again separate from that, the cooper shop 70x30 feet. So much for the structures themselves—now, let us glance at the surroundings.

LAND AND CANE.

The company owns 1,220 acres, of which 750 is under cultivation—500 of it in cane and 250 in corn, peas, etc. The soil is a rich vegetable mould or "muck," varying from three to six feet deep, but some of it twelve and fifteen feet—the former depth of three feet being amply sufficient to make, from year to year, without fertilization, the best quality of cane that can be grown in the United States. The most of this soil is pure muck—growing more productive season after season, while the balance is, approximately, muck nine-tenths one-tenth sand. No less than 30,000 acres of this rich loam, now drained sufficiently for cultivation, centers around St. Cloud, and the day is coming when the Kissimmee river will be the Nile of North America.

A GENERAL VIEW.

The village of St. Cloud is as yet, quite small but contains about thirty dwellings, two general merchandise stores, school, church, telephone and post-office, boarding house, drug store and one solitary M. D., but no barber.

Looking over this vast prairie of cane, vegetables and virgin soil, creates in the mind the singular impression made by the great Western plains near the Rocky Mountains—the "bigness" of the thing seems to dwarf everything else—even the four storied heights of the huge main building of the sugar refinery; but there is still enough of cold water around to please the most rabid prohibitionist.

In the foregoing description of the reclaimed lands we neglected to mention that into the chief canal, and mostly parallel to it, though with lateral arms, deep ditches run, at intervals ranging from three to eight feet wide at the top to a foot at the bottom. The distribution of these averages about two to the acre. The varieties of cane chiefly grown are the "purple cane,'" and the "red ribbon cane." Planting, in order to effect the best results, should commence early in December, and can be continued until the middle of February. In this instance the grinding season commenced December 5, 1889.

THE CANE PRODUCT

Has averaged, so far, this season, twenty-nine tons of cane to the acre, and the extraction of juice has ranged from seventy-eight to eighty per cent of the raw material. In other terms, 173 pounds of dry sugar is obtained from each ton of cane, or an approximate yield of 5,000 pounds of dry sugar to the acre! How does that strike you? Florida may not be a land overflowing with milk and honey, but it is bound to be a region running over with sugar and grapes.

The usual product of cane to the acre ranges from twenty-five to thirty-five tons and as to price, from $3.50 to $5.50 per ton, according to quality. The cost of production, as having reference to work executed by hired help, is reckoned at $1.25 per ton—this includes everything—leaving from $3 to $4 clear on every ton of cane, and much more if the work is done without the assistance of hired help—this refers to the operations of farmers outside of company's lands, who raise and furnish cane to the mill.

THE OPERATING FORCE.

The force of workmen is a large one during the period in which active operations continue. The "season" lasts from two and a half to three months—commencing about November 15, and ending, say the middle of February. All the remainder of the year the furnaces are out of blast, while nature takes her turn in developing the resources of "mother earth." Hence the management act on the motto of "making hay while the sun shines," mixed up with reasonable regularity, with moonshine and starlight, for the refinery is run day and night, employing a total of 225 men, of whom only about twenty are in the mill proper, but all under the direct superintendance of Col. L. A. Bringier, an expert in the business, who was connected with the sugar interests of Louisiana for twenty-five years, and who knows as much about cane and its evolution into sugar as any other man in this country, not even excepting the renowned Claus Spreckels, of anti-trust and Hawaiian fame. It may also be added that Col. Bringier is a gentleman of rare general intelligence, and is "at home" on other subjects aside from sugar.

The most of the laborers are Italians employed at $1.00 per day, ranging through other nationalities and ascending grades of skill, from $2.50 to $3.00 per day. The stock company itself consists of C. E. Etting, Edward Etting, Jas. P. Scott, Henry G. Morris, Hamilton Disston and one other whose name was not learned, all of whom are Philadelphia capitalists.

The acreage of cane planted by the company is traversed by five and a half miles of tramway, mule power, and there are 230 cane cars, each holding a ton more or less.

THE CAPACITY OF THE PLANT

Is from 75,000 to 80,000 pounds amounting to some 250 barrels per day of dry sugar, according to the density of the juice expressed with a residuum of molasses of the New Orleans type, amounting to 285 pounds to the 1,000 pounds of dry sugar manufactured. This capacity, more than equal to the 750 acres of cane now planted can be doubled by small additions to the machinery, which will be done as the industry is more fully developed, when 15,000 acres will be covered with cane. The present product of the establishment is from eighty to ninety barrels per day.

The mill was erected and the machinery placed in position by Mr. W. S. Hazzard, whose skill and experience in the business covers a period of over twenty years and was acquired in Louisiana, Cuba, the Hawaiian Islands and Peru, South America.

The machinery of the mill was manufactured by H. G. Morris —Morris & Barker Co., of Philadelphia, and the huge boiler by Wilcox and Babcock, of New York, It required thirty cars to transport the 300 tons of machinery. The building itself is of corrugated galvanized iron. In the interior the multitude of short stairways, the numerous platforms and architectural terraces render it difficult to make out where one story ends or another begins. The varied outline of the exterior is very handsome and imposing. The mill commenced operations on Monday, March 15, 1888. The task of clearing the land on which this great industrial structure stands, was commenced January 1, 1888, by Capt. R. E. Rose, then largely interested in this magnificent enterprise, costing over a quarter of a million of dollars, and which promises to lead to the investment of many millions of dollars within the next fifteen or twenty years. The first blow as relates to drainage, was struck a year before Captain Rose turned up his first furrow.

The pay roll of the Florida Sugar Manufacturing Company, as it is technically known, is over $3,500 per month in wages to employees, and even the force of 200 men can handle the cane from but little more than one acre and a half per day.

The St. Cloud sugar, by the barrel sells at 6¼ cents per pound, while it retails at seven cents, and is equal, in all respects, if not superior to granulated white sugar at ten cents per pound, as purchased at the general merchandise and grocery stores. This sugar shows no adulteration and is "polarized" or chemically tested at 99 9-10 of pure sucrose; only 1 1-100 of it being therefore, of refuse matter, while ordinary white granulated sugar is adulterated with from twenty-five to thirty per cent of glucose, or corn starch. This accounts for the expression so often made by visitors at the St. Cloud refinery, "Why, how sweet your sugar is." Hence this is not a mere matter of imagination, but of actual fact. Thus it goes much farther, pound per pound, than the imported article, while, at the same time, it is much cheaper, though it may not be bleached and otherwise manipulated to take out the slight yellow tinge, and by making it purely white lose one-fourth and over of its real, intrinsic value.

GENERAL REMARKS.

The refinery manufactures its own gas, which through eighty burners gives the illumination needed at night. There is likewise a large water supply, with adequate protective apparatus to guard against fire, while the whole mill from top to bottom, is kept as clean almost as a parlor. This is, indeed, one of the marked features, and one in which it differs widely from similar establishments of the kind elsewhere. It is estimated that the average yield of sugar per acre this season will exceed 4,500 pounds, making the total product of the plantation over 1,700,000 pounds. At five cents per pound this would reach $85,000, to which add $5,000 for molasses, or an agregate of $90,000 from 380 acres of cane—the average sufficiently matured for grinding.

As to percentage of juice to cane it may be said that in a recent instance a special test was made which showed 178 pounds of dry sugar to a ton of cane, or at a low estimate 4,983 pounds to the acre, say in round figures 5,000 pounds, while the best Louisiana plantations yield, on an average but 3,500 pounds to the acre. One week last year the Bowdon farm close by, gave the extraordinary yield of 4,558 pounds. The week ending January 12, 1890, gave an average, which is a low one, of 4,984 pounds of sugar to the acre. In addition to this there is a large yield of molasses selling at from eighteen to twenty cents per gallon, and this amounts, as stated before, to 285 pounds to the acre of sugar.

The refinery is run by a horizontal high pressure engine of 100 horse power, and capable of exerting a motive power of 125 horse power with steam at eighty-three pounds pressure—the fuel being mainly the dry chips, after the extraction of all the juice from them. It has been stated that twenty-nine tons of cane to the acre is the average, but it frequently rises to forty tons.

The operations of the company it is fully believed, will stimulate adjacent farmers to plant sugarcane exclusively and create a supply that will call for another mill of equal capacity. Contracts will be made with farmers, with this consumation in view, and moreover to purchase their entire crops of cane for a long term of years, the price to be determined by the density of the juice, as shown by actual test, and the market price of dry sugar. With juice at ten degrees Beaume and present rates for sugar, they offer $4.80 per ton of green cane delivered anywhere on the canal or banks of the two lakes. So that it will be accessible to water transportation. They are willing to contract for as much as 1,000 acres at a time, and furnish seed cane for the same.

At forty tons to the acre, a large and rather unusual yield it is admitted, the farmer, at $4.80 would make in the gross $192, out of which would have to come the cost of labor. There is not space in this article to detail the process of manufacture, nor to dilate upon sugar as a source of national wealth, and these must consequently be left for another opportunity.

In conclusion it may be said that such a sight as this, 500 acres in one tract, covered with sugarcane, has never before been witnessed in this country. The St. Cloud mill is one of the finest ever erected in the United States, or indeed, anywhere else. This enterprise opens the doors to a vast storehouse of wealth in Florida, that within the next quarter of a century, will make the State famous all over the world for the production of sugar. Grand as are the possibilities of the St. Cloud region, yet the true land of promise lies southeast of the Caloosahatchee river, on and around Lake Okeechobee—a land as much better adapted by nature for sugarcane culture than the flats of Kissimmee, as that place is better endowed than the low lands of Louisiana. Then all hail, to our great coming industry.—*Corr. Florida Agr.*

THE STRAWBERRY GUAVA.

A. K. Smiley, Before the Redlands Horticultural Society.

The guava belongs to the genus *Psidium*, a name derived from the word *Psidion*, a pomegranate, and belongs to the order *Myrtaceœ* or Myrtle family. There are at least six different species of guava—most of them belonging to the tropical regions. The guava jelly of commerce is principally obtained from *Psidium Guaiva*—a low-growing tropical tree found in the West Indies, and also raised in the southern part of Florida. There are a number of varieties of it, such as the pear guava, with white or yellow pulp, and the apple guava with red pulp. This guava has become a necessity to southern Florida, and is to that region what the peach is to more northern climes. The pear and apple guavas prove hardy in this climate, but the reports are somewhat conflicting. Parties at Pasadena, in Los Angeles county, and Ballena, in San Diego county, report it to be hardy

There is another species of the guava well suited to our climate—a beautiful, thoroughly hardy, easily raised evergreen shrub, fine for lawn or garden, called the strawberry guava, or in scientific terms, *Psidium Cattleyana*. Some authorities say that Brazil is its native clime. The fruit is globular, about one inch in diameter, borne in clusters, of fine claret color, and flavored like a strawberry, hence its common name. The skin has much the consistence of that of the fig, but thinner. The interior is a soft fleshy pulp, purplish red next to the skin, paler towards the middle and white in the center. It is juicy and in consistence is much like a strawberry, to which it bears some resemblance in flavor. The foliage is of a rich dark-green color, thick and shining, resembling the Camelia. This shrub is one of the most persistent fruit producing plants in the whole list. One can frequently find on one plant, flower, half ripened and fully ripened fruit.

The Dictionary of Gardening says that the strawberry guava grows from ten to twenty feet in height. It bears fruit when very young. It can be treated as an ornamental shrub, or planted in rows from four to eight feet apart and raised as currants are.—*California Fruit Grower.*