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The latest quotation of sugar in New York, April 1, was 3.12½ for Cuban Centrifugal 96 deg. test, and 4.37½ for granulated refined.

We have received from the New York Agricultural Experiment Station Bulletin No. 5., devoted to "the most common fungi and insects, with preventives."

An Exchange says: "Representatives of six beet factories met in San Francisco recently and formed an association to develop the industry. Three were Californian and three were eastern factories. Henry T. Oxnard. of Nebraska, was chosen president. This year there is sure to be another beet-sugar factory established in California, as all three now established in that state are paying well."

Mr. C. J. Lyons, in charge of the weather service, has commenced the publication of a much needed "Meteorological Summary and Record." The first number (January) has appeared, to be followed by monthly numbers. From this issue we learn that the average temperature for Honolulu in January, at 6 A.M., 2 P.M. and 9 P.M. was 64.45 : 74.06 : and 66.83, the mean of the three being 68.44. The rainfall data for the group is very full, the report covering 49 stations on five islands.

Nearly every cane sugar growing country is experiencing more or less difficulty regarding labor. Queensland having passed a law forbidding the importation of laborers of any kind, many of the cane fields will have to be abandoned, as the crops cannot be cultivated or harvested with white labor, so as to make it pay. In Cuba, where a sufficient area of cane was grown to produce one million tons of sugar, the actual outcome may not be over 860,000, owing to scarcity of labor.

The November issue of *Insect Life*, a periodical bulletin of the Division of Entomology, United States Department of Agriculture, contains an editorial article by Mr. L. O. Howard on "The Larger Corn Stalk-borer (*Diatræa saccharalis* F.)," an insect which for the past three-quarters of a century has been recognized as a serious enemy of the sugar cane in the West Indies and for a less period as an enemy of cane and corn in the Southern States, and which has been particularly abundant in the cornfields of Louisiana, where it was first recorded as early as 1857. It has since that period slowly spread throughout the cotton belt, and with the present season has rather suddenly appeared in Maryland and Virginia, seriously injuring corn. A full bibliographical history of the insect is given, together with a careful account of its life history and habits, illustrated by a number of text figures. This article will be of particular interest and value to planters and also to corn growers, as the insect manifests a tendency to migrate.

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THE AMERICAN SUGAR TRUST.

The American Sugar Refinery, or better known as "The Sugar Trust," has at last reached the point aimed at, when first organized five years since—the consolidation and control under one management, of all the sugar refineries in the United States. So long as the Franklin and the Spreckels Refineries of Philadelphia remained out, with a working capacity nearly equal to that of the Trust, the original object was unaccomplished. And when the Trust increased its capital in January to $75,000,000, it became clear that it was for the purpose of purchasing these remaining rivals, which were valued at about ten millions each, and the Trust is reported to have paid these sums to accomplish their pur-

pose, which is now done. What the result will be remains to be seen. If, like the Standard Oil Company, it succeeds in reducing cost of the refined article to consumers as low as it is in any other country, the consumers in America may be satisfied with the result. But there can be no doubt that producers in every cane sugar country outside of it will suffer by a reduction in the price of raws, as there will be practically no other markets for cane sugars but England and the United States, and whatever price is fixed by the Trust must be accepted by the producers. As American grown sugar will probably continue to receive the benefit of the bounty voted to it by congress, the production of sugar in the United States must, for the next few years at least, become a very profitable industry compared with that of other countries.

The following from Willett and Gray's Circular, gives the probable results on the sugar market for this year, from the consolidation of the American Sugar refineries in the hands of the Trust: "The tariff law is now such that at any price above the normal condition, say 4⅛c. net cash for granulated, the foreign article would come in very freely. The quotations to-day for German granulated is 4.37c. per lb. net cash landed in New York or New Orleans, which is equivalent to 4⅛c. net for the American, because the grocers will not take the foreign sugar except at ⅛c. per lb. below the American, as our experience last year shows. On the other hand, as regards raw sugar the figures all show, and the experience of importers confirm the fact, that from the establishment of the Sugar Trust, to the present time, raw sugars have been constantly cheapening, by reason of the reduced competition for them. It remains to be seen whether the absence of all competition will still further cheapen raw sugar, down to the bare cost of production. If so, the consumers will get the advantage of it, by the working of the tariff on refined, which admits of only a certain profit to refiners, without foreign competition. The condition of crops this year is such that, as raw sugar is already on so low a basis, any decline is improbable until the following crops. On the other hand, expectations of an advance may have to be abandoned. This is the situation as it appears to us at this writing, and we advise our friends to consider it fully settled, and pay no further attention to rumors."

WITH OUR READERS.

An admirable article on the system of sugar boiling with the vacuum pan, by Mr. E. C. Crick, will be found on page 153. The details of the process are given so minutely and clearly that it cannot but prove valuable to any one in search of information on this subject, or even to those not especially interested in sugar boiling.

Selections from some of the Stanford University Lectures, (page 160) will repay perusal. They treat principally of American fruits and the fruit business, but they contain much of interest to fruit growers here.

The subject of the deterioration of cane, initiated by Mr. Moore's timely article in the January number of this periodical has called out two admirable communications in this issue, (pages 165 and 171) both of them giving facts which tend to strengthen the position taken by him, though the writers may differ regarding the best plan to secure improved seed. The subject is by no means exhausted, and we invite further discussion on it, particularly the experiences, observations, and actual results of any experiments that have been made by those who are now or have been formerly engaged in cane planting. We believe the Lahaina to be the most valuable cane ever introduced here, and it should be the aim of every planter to keep it such, and arrest any deterioration that may be observed in his fields.

If in any one thing our plantations have made more progress than in others, it is in the economy of fuel used in the mill. It is only a few years since the fuel bills on all our plantations ran up into the thousands of dollars and cords. Now many of our mills dispense with wood and coal altogether, using nothing for fuel except trash, and are even unable to consume all the trash made. The great point of study now is to carry on diffusion with the same economy of fuel. Every year a few gains are effected, and it will not be long before coal and wood are wholly dispensed with in diffusion as they have been in some mills. This is the aim of Mr. J. N. S. Williams in the process described by *Sugar Cane* on page 167.

It seems a little odd to read of banana culture in the United States, yet it is a fact which is each year becoming more clearly demonstrated, that the time is rapidly approaching when a large share of the bananas consumed by her will be raised on her own soil. Those who doubt this, can read the statements made on page 174, showing what is being done in this line in Florida. Bananas and pine-apples will be sure crops in that state. It is only a question of time.

An article from *Sugar Cane* shows what progress is being made in Mauritius in raising seedling cane plants. It is stated that from a lot of about 700 plants, 288 of them had escaped the ravages of the insects and were doing well. The measures taken to fertilize the cane flowers, are simple and can be done by any one. The cane which gave the most seeds is called by the botanist, the "Bambou," which may be the "Rose Bamboo" imported several years ago from Queensland, and which will be found abundant in Kau and Hamakua on Hawaii.

Mr. Sunter's communication corroborates what has before been published by Mr. Miller of Kona, regarding the existence of one of the lady-bugs in the coffee fields on the islands. Time may prove this insect to be of more value than is at present believed to be the case. The suggestion made by Mr. Sunter, that the Legislature should make provision for the employment of Mr. Koebele, with the view of securing the best enemy of the coffee pests is sound and ought to be adopted.

Several other short articles on cinnamon, vanilla, Cuba and Fiji will repay perusal.

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THE CENTRAL FACTORY SYSTEM.

A very interesting address has lately been delivered before the Louisiana State Agricultural Society, by Wibray J. Thompson, on the subject of Central Sugar factories. This address seems to cover the whole ground involved in the question, and he most certainly brings out its strong points in the most convincing manner possible. He says:

"As heretofore conducted, the production of sugar from sugar cane

has everywhere involved its producer in two entirely distinct pursuits, either of which might, of itself, have been expected from the beginning to tax to the utmost his time, energy, knowledge and capital. * *. *

"There is no business carried on in a large way more exacting than has become that of expert sugar manufacture, except, perhaps, it be the skillful conduct of sugar farming on an extended scale. It is these two which we are trying to reconcile and combine under one management. Unlike in every regard other than this of their exaction, each of these requires for its successful prosecution both an innate taste and a special training different from the other. No one who fails to appreciate the splendid resources which are essential to complete success in each branch of this dual business can have made serious effort to master either. No man may expect to be at once an intellectual paragon and a physical Hercules, yet, were it otherwise, necessity would still compel neglect of one were proper attention bestowed upon the other.

"We will consider first and briefly the advantage which must accrue from such to manufacture. Initially, it will reduce the first cost of all new plant required by, perhaps, one-half, and in equal proportion will curtail all the fixed annual charges attaching to this. In 1886 I caused to be made careful estimates for a 3,000,000 pound establishment, new in every detail and complete in the highest sense of that time. I caused simultaneously to be prepared estimates for ten-high grade, open-train houses, each of 300,000 pounds annual capacity. At that time these ten, with their total output of inferior product equal only in amount to that of the one, would have cost rather more than twice the price of the single large and perfected house, and I doubt not that at present a 5,000,000 or 10,000,000 pound factory, as complete and perfect as our present knowledge permits, could be erected at not to exceed one-fourth to one-third the cost of ten equally faultless institutions, which should have each but one-tenth its capacity."

Commenting on Mr. Thompson's address, the *New Orleans Times-Democrat* says:

"How the system would affect the agricultural branch of the sugar industry has not been as clearly shown. That the union of two such different lines of business as farming and manufacturing is unfortunate has long been recognized. There are few men capable of carrying on both successfully. One planter may be a good agriculturist and raise a large tonnage of cane to the acre, but perhaps he does not succeed well in the manufacture of sugar; another understands the sugar house part of the business, but fails with his cane crop. The central factory will separate these two alien branches. The planter will be released from sugar house bondage; he need not worry about the

manufacture of sugar, and can devote himself entirely to the consideration of agricultural problems, with the probability that he will greatly improve his methods of fertilization, etc., and secure a larger and a better yield. There has been some improvement in this of late, but there is room for more, both in the tonnage raised per acre and the percentage of sugar to the cane. With better transportation facilities and more time for cultivation, the crop ought to be safer and the profits larger. It will improve the value of land; it will bring about the redemption of lands now running to waste, and their devotion to agricultural purposes; it will attract immigration; encourage small farms, one of the greatest safe-guards and assurances of general prosperity."

There can be no doubt that the Central Factory system may be adapted to Louisiana, while at these islands, where the population is more sparse and labor consequently less reliable, there is less prospect of successful co-operation. It has been tried here, and in nearly every instance has proved unsatisfactory to the cane grower, arising chiefly from the unequal division of the profits. There are three ways in which the planter can be paid; first by the sale of standing cane to the mill owner for a given sum per acre; second, by a given sum per ton of cane in weight, and third by a division of the sugar manufactured. The first and last modes have been tried here, but in Louisiana the usual mode is to pay a stated price for the cane delivered in the field or at the mill. Sales by the ton are generally the practice in the sugar beet industry in America; formerly four dollars per ton were paid for beets in California, but now five dollars are paid for the same standard of beets.

At Watsonville, California, the beet growers contracted at four dollars per ton for their beets, but after the passage of the bounty law they refused to continue to cultivate for that price, while the factory secured the full benefit of the bounty. The cultivation this year is carried on with an advance of twenty-five per cent. in the price per ton, and so far as can be judged by outsiders, this arrangement ought to result in producing all the beets needed by the factory. Only by a liberal policy towards the beet growers, can the beet industry prove successful in America and the same remark will apply to the central factory system in Louisiana, where the planter, unless secured by a long-term contract, is at the mercy of the factory, and liable to have his crop depre-

ciate or entirely ruined on his hands, unless he accepts whatever price may be offered by the mill owner, which, in some cases, is doubtless below the cost.

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FOREIGN SUGAR ITEMS.

The sugar beet industry of South America already gives signs of life. In Chili there are two beet sugar factories; beets there have tested as high as 18 per cent. sugar.

Manufacturers now ridicule the idea of returning residuum molasses to the diffusion battery; the method can never lead to satisfactory results, as it introduces an element of impurity into the diffusion juice that would not otherwise be present.

A beet sugar factory in Bohemia has a capacity of 1,000,000 lbs. raw sugar per diem. In it there is used a compound steam engine of 2,000 H. P. The Steffen process being adopted, no crystallizing tanks are needed; there are sixty centrifugals for separation of sugar from *masse cuite*, 46 filter presses, six vacuum pans, etc.—which give some idea of the gigantic scale on which beet sugar is made in that special establishment. American beet sugar factories are a long way behind this.

Efforts are made to limit the production of beet sugar with the view of keeping up prices by a special agreement. The production of Bohemia is to be 16 per cent. less than last year; the Hungary production to be increased 7 per cent., while that of Silesia and Moravia are to be diminished 30 per cent.

The cultivation of beets from buds, without seed, is becoming a great success. From 200 mothers 12,000 beets have been obtained. It is a well known fact that the saccharine quality of sugar beets increases with the number of concentric rings; to the latter correspond leaves, which are subsequently followed by buds. It consequently follows that richer the beet, more numerous are the buds, and better is such root suited for the multiplication of its species. In the future there may be obtained a special variety of beet that will not go to seed under any conditions in which the root may be placed.—*Beet Sugar.*

CORRESPONDENCE AND SELECTIONS.

VACUUM PAN; OR, THE SYSTEM OF SUGAR BOILING.

Editor Planters' Monthly:

In the present condition of the sugar market, when the one absorbing problem of economy is unfortunately solved by the major part of our planters by a depreciation of skilled labor, and a decided favor towards cheap and locally experienced hands, the result of which sooner or later is nothing short of financial suicide, when matters have arrived to such a point, then, I consider I will not be going beyond my octave in dealing with a few subjects which may enlighten parties desirous of acquiring a knowledge of sugar boiling, and to whom information shrouded in mystery might have been attached, together with an exorbitant tuition fee, by our worthy Hawaiian sugar cooks.

The subject with which I shall first deal will be the "Vacuum Pan," couched in as brief and concise a manner, as I trust will be intelligible to our readers.

The primary point is to thoroughly examine the interior and exterior of the "Vaccum Pan," the coils, learn the position of the tail pieces and the dip pipe from the charging cock. In as few words as possible a vacuum pan is a globular or pear-shaped vessel of copper or cast iron of from six to ten feet in diameter, provided with a steam jacket over its lower portion, and with from three to six larger coils or rather helices of copper steam pipe in its interior. At the lowermost part of the pan there is an outlet which is closed with a slide valve or other suitable arrangement, and on the top it has a wide neck leading to the condensing apparatus and vacuum pump.

There is an arrangement in its side or near the top for taking samples or "proofs" of the sugar when boiling, an inlet for the admission of the syrup which is to be cooked; an air cock, thermometer and vacuum gauge, and two or more bull's eyes, or peep glasses, through which to watch the progress of the boiling. The condenser is usually an iron vessel or cylinder from two to four feet in diameter, furnished with a

supply of water to a perforated tray: a large pipe passes from its bottom to the pump to take off the water used in condensing the vapor coming from the vacuum pan, and there is a delivery pipe from the pump to carry away the water outside. The vacuum pump is generally twenty inches in diameter, making a two-feet stroke, and is capable of removing so much of the air from the pan that what remains has only elastic force enough to support a column of mercury two inches in height instead of the thirty inches which it does when at full pressure. In using the vacuum pan, the pumps are first set going, and as soon as a vacuum of 23–24 is formed, enough syrup is drawn in to cover the jacket and bottom coil, after which steam is turned on in both. With a careless sugar cook a singular accident can now happen. If steam has been turned on in the coil before it is entirely covered with syrup, as I have seen done, the pan is liable to get intensely hot, and this heat is soon communicated to the pump barrels, which then refuse to draw water, the vacuum is destroyed, and boiling operations entirely suspended. The remedy is to stop the engine and let the pan and pumps cool down, which they will take four or five hours to do.

Steam having been turned on as above mentioned, the liquor will shortly be in full boil, as seen through the peep glass, though the temperature as shown by the thermometer is only 145 to 155 degrees Farenheit instead of 214 degrees or thereabouts at which syrup will boil in the open air. The reason of this is, that a liquor boils at a lower temperature when the atmospheric pressure has been wholly or partially removed, because as it boils, the elastic force of its vapor becomes greater than the pressure exerted on its surface, and as the elasticity of the vapor of all liquids is increased by a rise of temperature, it is plain that such will boil at a lower temperature in a vessel from which the air pressure has been removed, because the point at which tensions of the vapors will exceed the remaining pressure on them will be sooner reached. The degree of vacuum is regulated during the boiling by the injection cock and the pressure of steam; the wider the injection cock is opened so much the more water goes into the condenser, consequently from the quicker condensation of the steam the barometer falls. It is customary to boil with

a pressure of six to eight lbs. steam at this period with a vacuum of 24 to 26 inches as shown by the guage, when the temperature will be between 160 to 165 Farenheit.

When the syrup in the pan is thin, the waves it makes in boiling are high and sharp and pitch about lightly and frothingly, but as it gets more concentrated they become heavier and less lively, all of which can be distinctly followed through the peep glass. The time now approaches when by means of the "Proof Stick," our cook begins to try the stoutness of the pan's contents, i. e., to see whether its degree of viscidity shows that it has been so much reduced that sugar is ready to crystalize. Before proceeding to this point, however, I must say a few words about the previous boiling down of the syrup to this degree of concentration. It is customary to draw into the pan as much syrup as will cover the bottom coil (after having been reduced by concentration), this is called "graining low." Some sugar cooks prefer to grain higher up, and some when the pan is half full. The objection to graining high is, that the grain has not so much time to grow in size, and this is a very sound objection, but does not, from the shape and interior construction of the pan, always hold good. If a vacuum pan takes, say seven hours to boil a strike of eight tons masse-cuite when grained low, it will take only six hours to boil a similar quantity of grained high; the crystals in the second case will not be so big as the first, but in a large eight-ton pan they will be of a fair size even by the quicker method. It sometimes happens (though not often) and this, although I cannot give a good reason for it, is well known and appreciated by pan-boilers—that sugar of a large crystal and better quality can be made in some pans by high than by low graining. I knew of a pan in British South America in which for a long time good sugar was not made until a pan-boiler, at the suggestion of the engineer, tried graining high, and the sugar then turned out was very satisfactory; the same man tried graining low in the pan and was most unsuccessful. The reason for this is probably to be found in the position of the coils, but this explanation, to my mind, is too vague to be deemed satisfactory.

In drawing in syrup for boiling down, the following plan is to be adopted: Open the charging cock and keep your eye

on the inside of the pan through the peep glass, and as soon as the liquid boils up to the height of the bull's eye on the opposite side, shut off the charging cock. The contents will boil up, but quickly go down when you must open again, shutting off as before when the liquor boils up to the same height. This operation is kept on until you have taken in the quantity of syrup with which you intend to form grain; it is impossible to specify this quantity exactly, but roughly speaking 2,000 gallons of 18 to 20 B syrup to a five-ton pan is about the correct amount provided that your juice is yielding well, by which I mean that few gallons are required to make a ton of sugar. One or two lessons in front of the pan will teach you this directly, only, be careful not to charge the pan with too much syrup at a time so as to cause the contents to boil and froth up above the opposite bull's eye as explained above, or some of the syrup will go over into the condenser and be sucked through and thrown outside of the pump. A higher pressure than five to six lbs. steam at this time will cause a similar result.

And now for the granulating point. This is easily recognized by a good sugar cook, but is difficult to describe with any amount of accuracy; however, one may say that if a "proof" of the syrup taken between the thumb and finger, draw to a thread three quarters of an inch long, the point for graining has been reached. At the same time, this test is of no value if the syrup is the least sticky either from under tempering or sour cane, as a thread can then be drawn out long before the granulating period has been reached. Immediately before the crystallization begins, the syrup in the pan is a concentrated solution of sugar which only requires disturbing to begin depositing some of that matter or body in solid form. This disturbance is brought about by opening the charging cock (for say six beats of the vacuum pump when you can hear it) and letting in some syrup; this is repeated at two or five minutes intervals, and after the third, fourth or fifth disturbance a proof of the contents held between the thumb and finger, or better still, dropped on a piece of glass and looked at through it, will be seen to have small crystals floating in it; these rapidly increase in number and size until the whole mass of liquor is filled with them. As each fresh lot of syrup

is admitted into the pan, it deposits for the most part on the grains already formed, thus causing them to grow larger and larger. During the process of granulation the temperature should never be more than 160 to 164 degrees Farenheit, though it can be raised later on to harden the crystals; but this must not be done too soon after granulation, for there is a great danger that the already formed crystals will melt. I will submit the following rules for guidance when graining:

(1) The thinner the syrup admitted into the pan the bigger will be the crystals obtained; the more concentrated the syrup so much smaller will the crystals be, because in the latter case the syrup is too stout to allow the crystallization to have a perfectly free and open formation.

(2) In making large grain sugar a heavy charge of syrup must be admitted into the pan at a time, so as to give the grain more time to grow between each disturbance. Should small crystals be required charge often, and in smaller quantities, so as to disturb the growth of crystallization.

(3) The larger the crystals you require so much more quietly and slowly must the boiling be carried on, and in order to have the grain regular, granulation is to be brought about very slowly, and on no account must the grain be forced by boiling very high before the first charge. Pan-boilers are only too fond of forcing grain, as it lessens the chance of false grain forming hereafter through carelessness. About an hour after granulation, it is very advisable for the chemist in charge to visit his sugar cooks, and after having taken a proof put it on a piece of glass previously wiped and clean. Hold the glass up to the light, and if the crystals are in great number, very fine and close together, you can be pretty sure that the grain was "forced" if the syrup was not more than 22 degrees Beaume. The "proof" does not denote a satisfactory state of things unless the "sling" between the crystals is perfectly clear and bright, and there should be plenty of it in between the grains. If the "sling" does not look clear and bright but "smoky," you can be absolutely sure that there is something wrong and the probability is that that something is "false-grain," or as some sugar cooks in their guilt will persist in calling it a "cloud." Without care a "cloud" may form at any time. Impress on your mind that the further

apart the crystals are from each other, and the larger they are the greater the chance for false-grain. The two periods during the process of boiling when the danger of false-grain forming is greatest are: (1) When sulphuric acid is admitted into the pan (in course of yellow crystals' manufacture). (2) The opening of the sugar when re-starting the pan to "double," that is to say, in this latter case when having struck out half the contents of the pan you go about again, admitting fresh portions of syrup on to the masse-cuite left in the pan.

Sugar-boilers frequently get "false-grain" in their pans, but drive it away before striking, and the fact goes no further; only the number of gallons of juice taken to make a ton of sugar is fearfully increased. In a case in which false-grain is very bad, there is no remedy, but the very best and the only course to pursue is to strike out all immediately, and spin in the centrifugals using a little warm water. The use of hot water is, however, only to be recommended when the sugar cannot possibly be cured, as its use is attended with great loss. When the "cloud" is not very bad, the best way to get rid of it is as follows: If the pan is not more than half full or only very little more, shut off the injection or nearly all, and make a few heavy charges, the heat combined with the washing influence of the new syrup washes and melts away the false-grain. If, however, the pan is nearly full, and false-grain is fairly developed (through gross ignorance or negligence of the sugar cook), the remedy is to shut off the injection cock, as in the other case, and work the masse-cuite up as high as it can be got. This plan will not eradicate all traces of the "cloud," but will do so sufficiently to allow the masse-cuite to be cured.

As the process of using sulphuric acid and "bloomer" is confined to marketable "yellow crystals" and not to non-chemical sugars for refiners (such as are manufactured on these islands), it is not necessary to dwell on the course of operation necessary. Should you find during the process of boiling that the syrup or masse-cuite gets very hot, the vacuum at the same time being bad, you must look out for a leak in one of the coils. In such a case it is best to strike out as soon as possible, then take water into the pan by starting the

pan engine, shutting down the foot-valve and opening the injection cock. When by these means the coils are covered with the water, look through the peep glass and if there is a leak, the steam leaking from the coil will make the water bubble just over the place where the leak is situated. Steam should be turned on in one coil at a time so as to enable you to determine which coil is leaking.

If the water passing through the condenser is not sufficient which would also cause bad vacuum and excessive heat, you will probably find that the packing of the pumps or glands is the cause, through being old and worn, or that the well from which the water is drawn is choked with weeds or dirt. To find out if your vacuum pan is really doing its work is an important point. Numerous experiments have shown that during the strike each foot of worm evaporates from twelve to thirteen pounds of water per hour at the usual pressure of ten to twelve pounds steam, and a particular experiment in which every drop of condensed water was caught, showed that for every 10 lbs. of water in syrup evaporated, there was caught 10.88 lbs. condensed water.

We now come to the "striking point," one of great importance and in connection with this, the following rule must be borne in mind: The bigger the grain in the pan the higher must the sugar be when struck out. Many sugar cooks when about to strike are guided almost entirely by the degree of vacuum indicated, striking at 26½ vacuum with free and 27 with sticky sugar. It is better to be guided entirely by the proof removed in the proof-stick and not by the appearance of the masse-cuite when it strikes against the peep glass in the ebullitions of boiling The right point for striking is when the proof of the masse-cuite will scarcely run out of the socket. Do not, however, be guided by the first proof indicating a required degree of stoutness, but take four or five proofs from the pan one after another in rapid succession and therefrom form your conclusion.

Another method is to notice if the masse-cuite on striking the peep glass remains sticking or runs down it. If it remains sticking the time for striking is about reached. It is very important that the sugar should be struck high, but the outlets of some vacuum pans are so small that a proper de-

gree of stoutness cannot be reached without danger of the whole mass becoming hard and fast inside the pan. Massecuite on leaving the pan should look light red in color tinged with gold, and must be struck to a temperature of 160 degrees Farenheit, never higher.

There are several more points connected with sugar cooking, such as "Doubling" and "Molasses" reboiling, etc., from which very little can be learned theoretically, whilst a like practical knowledge will enable one to surmount all minor difficulties and eventually arrive at the fact that the whole mystery of sugar-boiling was only a process of sugar-cooking, save the "Clarification of Juice" on which I shall deal in your next issue. E. C. Crick.

Honolulu, H. I., March, 1892.

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STANFORD UNIVERSITY LECTURES ON THE FRUIT INDUSTRY.

A series of lectures on the Fruit Industry of California have recently been given at the Leland Stanford University of California, by Emery E. Smith. They have been interesting, but are too lengthy to copy in full. From a report of them published in the *San Jose Mercury*, we extract a few paragraphs, which will prove instructive reading to those engaged in fruit culture here :

"Our evident work at the present time is to use every effort to make our dried, canned and green fruit a standard article of diet. This can only be done by selling it cheap and by teaching people how to use it. We might take a hint from the general Government, which not long since sent an agent to Europe to teach the people how to use corn meal, our cheapest bread-stuff. This agent's work will doubtless disperse illusions, impress upon the people of the countries visited, that corn meal makes a palatable and nutritious bread and in the end will doubtless stimulate our exports of corn. The organization of the fruit-growers of the State to further mutual protection against dishonest buyers, sellers and commission men, and to regulate grades, adopt brands, etc., is highly commendable, particularly in the present disorganized state of trade. It should, however, be borne in mind that our

fruit industries are new, and while to us, they are of the greatest importance, they are but a small item in the aggregate commerce of the country; therefore, it is the part of discretion not to waste our energies upon what must prove futile attempts at perverting the regular methods of distribution, but rather spend the same thought and energy in the perfecting and maintaining of the superior qualities of our fruit, and the cultivating of the public appetite for them. We are thousands of miles distant from the centers of distribution and our green fruits particularly have to compete with that grown locally; therefore, rapid transportation, cheap rates, and methods of preservation are of prime importance.

"The transportation problem is being solved by a yearly improvement of schedule, and it is now possible to send our fruit to the most remote part of the United States so as to give it several days' life after arrival. Rapid transportation and improved refrigerator cars are jointly to be thanked for this favorable feature. The existing high freight tariff upon our fruits, both green and dried, is a heavy draught upon the producing capacity of our orchards, and correspondingly increases the cost of the product to the consumer. This will be better understood when I say that it now costs $425 for freight charges and refrigerator car service by freight train to place a carload of 20,000 to 24,000 of our green fruit in Minneapolis or Chicago; New York and Philadelphia, $535; Boston, $549.40. To show what proportion of the gross sales it takes to cover this enormous freight charge, I cannot do better than use the figures of Senator L. W. Buck, manager of the California Fruit Union: 'I have taken a number of account sales at random from this year's business, with the following result: Gross sales, $209,663.20; freight, $109,191.-90; net returns to shippers, $88,743,40. Thus, it is seen that the freight charges were $20,450 in excess of the net profits of the shippers.'"

"The primary object of the production of all new varieties of fruit is the increase of the quantity and quality of our food supply. We well know that varieties of fruit have an individuality, but regarding the principles controlling its varying or

retention, we know but little. We have a limited knowledge of the means employed in reproducing and bringing into existence new forms, but it is beyond the ken of men to tell certainly what a given seed will bring forth, for every seed contains the possibility of infinite variation. In entering upon work of this kind, the experimenter should ever bear in mind the fact that by some course of applied reasoning, freak of nature or accident, the most gratifying results are possible at any time, although failures must of necessity be very numerous, on account of our present imperfect knowledge of governing principles. The origination of new varieties of fruit for California is particularly desirable, on account of our peculiar climatic conditions, but also to give us superior fruits to those produced elsewhere. What we want are those varieties which are best suited to the highest development of our various fruit-growing industries. Our climate and soil are admirably adapted to the production of improved varieties, as has already been proven by a number of chance seedlings, which, when introduced, have at once taken the place of standards."

"As to the relative values of budded and grafted trees and devitalization of varieties by continuous propagation of these methods I have inspected thousands of trees and a great many orchards, both young and old, in search of light and have been forced to the conclusion that where the stock and bud or scion are suited to each other, and the union is perfect, the trees are equally valuable; and further that the trees under the same condition will live as long as seedling trees of similar types. The long life of some seedling trees, which is attributed to inherent vitality, is rather due to their isolation, which has given them unusual advantages under which to develop, and by the fact that their vitality has not been impaired by the tree butchery too often practiced under the guise of pruning. As to the devitalizing of varieties by repeated propagation by bud or scion I have never yet seen any conclusive evidence of such results, but some investigators claim to have found illustrations of this."

"The soils suitable for the production of fruit in California

can only be regarded briefly as a general discussion of their merits here would consume too much time. We are indebted to Professor E. W. Hilgard for nearly all of the scientific investigations of our soils which have been made. Professor Hilgard's wide experience and special taste for this class of work has been of great value to the fruit-growers of California. A systematic and complete survey of our soils is to-day one of the greatest needs of the State. The soils of California are, if possible, more complex than the climate, and it is not unusual to find half a dozen distinct kinds of soil in the space of a hundred acres. This makes it necessary for those contemplating the planting of an orchard to consider the adaptability of the soil to each variety to be planted, as well as the suitability of the exposure and elevation. I have seen orchards that were perfect failures, which, had they been planted upon another part of the same farm, would have been beyond a doubt successful.

"The desirability of a location also depends largely upon transportation facilities, and this again depends upon the varieties to be planted. As the shipping of the crop is a most important item, it is desirable to be as near the railroad as possible, on a main line and near a shipping center, and where there are smooth, hard roads. The adaptability of the soil for the making of good roads or the availability of material for such work, is often a very important consideration. This is of great importance when green fruit is to be marketed in a dried state, as the latter is much reduced in weight and is of correspondingly greater value per pound, thus admitting of more expensive transportation.

"If the land to be planted is already in the possession of the prospective orchardists, all idea of following pet fancies in regard to varieties should be banished, and strict adherence given to those sorts which have proved profitable and which are especially adapted to the climate and soil of the location. Watching a few growing trees is a much better method of testing this than any amount of talking. The orange tree is a greedy feeder and therefore a soil rich in the required elements needs to be selected, but it will thrive in a lighter soil, if loose enough for the roots to easily penetrate and if the trees are at greater distances apart. But few soils, how-

ever rich, will long produce first quality oranges without annual applications of fertilizers. The correct method is to have the soil carefully analyzed and then by supplying deficiencies, to never allow it to become impoverished. The best orange soils are strong, black or sandy loamy deposits; strong, reddish clay and decomposed granite, and some special combination soils, containing considerable broken stone and gravel, are excellent. Adobe soil subjects the orange tree to disease. The location should be sheltered from winds, as the fruit is heavy and therefore liable to thorning and bruising, and it should be free from frosts, since the young growth is very tender. The nights should be equitable and warm, otherwise the fruit will be greatly retarded in ripening and deficient in sweetness, which continuous heat alone develops in the orange."

"Botanical gardens, which in European countries form one of the greatest features of their civilization, are well-springs of beauty and utility, where the learned and ignorant alike can seek mental refreshment direct from nature in her most perfect and varied forms. The United States has been peculiarly negligent in this respect, and the one little botanical garden under national auspices at Washington is but a sorry comment on our progressive intelligence. A movement is now, however, on foot in New York city to raise $250,000 to establish a great botanical garden on the Bronx river near that city, and I am glad to say that the effort has every appearance of success. The Arnold Arboretum, a part of the park system of Boston, is a noble gift to the public, the development of which is largely due to the efforts of Professor C. S. Sargent, its director. This is the largest space in the world devoted to dendrology as a scientific study, one hundred and fifty acres being devoted entirely to the cultivation of woody trees, vines and shrubs. Shaw's Gardens, which, as a restricted botanical garden, has for years delighted the people of St. Louis, has recently been converted into a training school for gardeners, two years of study and practical work in the grounds and the conservatories completing the course. This departure, which is under the direction of Professor William Trelease, is meeting with great success. A college of techni-

cal horticulture is also about to be established in England, upon a somewhat similar but more extended basis, under the auspices of the Gardeners' Association and the Royal Horticultural Society. The press may be regarded as one of the greatest intelligent forces of modern civilization, and what it has done for every department of industrial and social life, it has in some measure done for horticulture. The best class of rural journals are, outside of religious, scientific and literary magazines, the purest periodicals published, and, as revealers and disseminators of truth and beauty, as an inspiration to original re-search, and as regulators and moderators of commercial enterprise, they occupy, and must ever occupy, a place of the utmost importance in horticultural education; hence, the desirability of encouraging, morally as well as financially, those horticultural publications, which are striving to fulfill their noble duty."

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DETERIORATION OF CANE.

Editor Planters' Monthly:

Mr. Moore's article in the Planters' Monthly for January tells us, that so far as he can ascertain, at Paauhau, sugar cane has deteriorated twenty per cent. in six years. As I have perhaps an unusual amount of opportunity for obtaining personal and hearsay information, I take the liberty of contributing a few remarks. Let me say, first, that I have several times heard speculations as to the apparent deterioration of Lahaina cane from planters. Unless all dedetails are altogether untrustworthy, we never now, even from new lands, get the yields reported about twelve years since.

We are apt to overlook the fact, when speaking of seed cane, that sugar cane belongs to the family of seedless plants, and that we plant *cuttings* and not seeds. One peculiarity and advantage of propagation by cuttings is, that we merely continue the growth of the original plant in another place, and therefore are certain to obtain a similar plant. In the case of propagation by seeds this is not always the result, hence the necessity for budding and grafting to insure similar plants.

Now it appears to me that if we plant Lahaina cane cuttings, we shall get Lahaina cane plants; and whether these plants will be good or bad (from a sugar-producing point of view) will depend more upon soil, temperature, weather, cultivation and conditions of growth, than upon the saccharine quality of the cuttings planted. As, however, in propagation by cuttings, the younger, juicier, and more recently developed the cutting is, the more rapid and luxuriant will the growth of the ensuing plant be; the green top of the cane is most likely to grow most rapidly, and therefore produce the finest cane in a given time. For this reason, and because they are of no sugar producing value, tops are greatly used for planting. My own experience and that of numerous planters with whom I have spoken, is, that apart from rapidity of growth (in which particular tops excel), we have obtained equally good cane from all sorts of seed—plant-cane, rattoons, *lalas* (branches) and tops. I am now speaking only of the saccharine quality of the cane, not of cost of planting, obtaining seed, replanting, etc.

In obtaining crops from seeds, however, it is a well known rule, that few seeds succeed and flourish if planted always in the same soil, or even in the same neighborhood, therefore there exists a system of interchange of seed in all well farmed countries. Now in growing sugar cane, we cannot avoid always planting cane on the same soil, as it is the sole crop, but we may avoid always taking our cuttings from the nearest field. Amongst the now defunct small planters, there was a good deal of importance attached to "moving the seed," that is, planting cuttings as far as possible under different conditions to those under which they had been produced. It is to be regretted, that owing to the lack of any reliable and complete statistical information, we can compare yields of cane per acre, and yields of sugar per acre, only in a very limited and unsatisfactory way. We have the authority of the director of the experimental station in Louisiana, that canes imported and planted there, "gradually change their characteristics;" and therefore it is possible that cane planted year after year on the same plantation *may* deteriorate. Would not possibly good results be obtained by planters obtaining a supply of seed from another planta-

tion, where the conditions of weather and soil were different and starting a good sized nursery for future planting? The Paauhau plan of planting only the high polarizing part of the cane seems likely to prove futile and difficult of execution. The quality of beets has been greatly improved by the judicious selection of the plants reserved for seed producers, being only those of high saccharine quality. The beet roots are individually tested; either before being dug up or afterwards; by a small quantity of the pulp of each being rasped out and tested by the polariscope. Only seed from the richest is used for future planting. Can such a system be followed with sugar cane? If the *whole* of a stick of cane be planted, the plants resulting from the tops will be superior to those from the richly saccharine portion.

My object in writing is, if possible, to stir up discussion because, if our cane is deteriorating, in spite of our better methods of manufacture and cultivation in any such degree as Mr. Moore would seem to conclude, it is a very serious question. It would be interesting if any of your readers, who are in a position to either actually or approximately compare weights of cane produced, and sugar yielded would give their opinion.

T. R. KEYWORTH.

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COMBUSTION OF FINELY-DIVIDED BAGASSE.

We have received the following information respecting the "Williams Patent Semi-forced Draft Furnace," adapted for the combustion of finely-ground megass from mills where maceration is used, and especially of the exhausted chips from the diffusion batteries. These furnaces are manufactured by the Union Iron Works Co., Limited, of Honolulu. Under the present circumstances of the McKinley bill, which has very much altered the once favorable position of the Hawaiian Islands as regards sugar exports to the United States, by introducing a competition on equal terms with European sugar-producing countries,—it is conceivable that any economy which can be effected by this or other appliances must be extremely valuable in that quarter.

Shortly after passing the ratification of the Reciprocity Treaty between the Hawaiian Islands and the United States,

Mr. Claus Spreckels made arrangements for the establishment of the gigantic plantation now known as Spreckelsville, the property of the Hawaiian Commercial Co. Amongst the several radical changes and improvements introduced into these mills was the 'step-ladder furnace,' now in universal use in the Hawaiian Islands. Until these furnaces had proved their ability to successfully consume trash or megass direct from the crushing rolls, the ordinary practice was to have drying grounds and storehouses for the megass; and the furnace in use was very similar in design and proportions to that commonly used for coal or wood, and, as a matter of fact, it was impossible to burn economically green megass in the furnace in use at that time:

There was nothing specially new about the step-ladder construction of furnace grate bars. They had been successfully used in Europe for burning peat or lignite; but the adoption of these grate bars for combustion of megass was a long step to the front, their value was immediately appreciated, and their use became general in a very short time.

In 1888, the first diffusion plant in the Hawaiian Islands, was erected at Kealia, Kauai, and, after a few weeks of running, it became very evident that the old style of step-ladder furnace was not well adapted for burning the diffusion chips after the water was expressed from them. Many experiments were tried, and finally the style of furnace that did the best work was a combination of step-ladder bars with ordinary coal grate bars. This was the best that could be done up till early in 1890, when, after much thought, the furnace known as the "Williams Patent," was designed and tried; it was successful from the first. The principles underlying the construction of this furnace are: First, such design as makes it possible to absolutely regulate the supply of air to the fuel; second, to introduce such air in the best possible manner; and third, to arrange the construction so that it be easily adapted to brick work, and at the same time to utilize as much as possible of the existing iron work. This has been successfully done in this furnace; the supply of air can be regulated to a nicety, and the required castings can be adapted to any of the existing arrangements in this country.

The following calculation of the approximate heating

value of megass from double crushing and maceration will prove interesting: 100 pounds of average cane contains 89 pounds of juice, standing 10 per cent. Baume, and containing 18 per cent. of solids and 11 pounds of woody fibre. Assuming that 15 pounds of maceration water is added per 100 pounds of cane, and that extraction of soluble solids is 90 per cent., and also that the resulting megass contains 50 per cent. moisture, then 100 pounds cane plus 15 pounds maceration water, and minus 22 pounds megass containing 11 pounds fibre and 11 pounds moisture, equals 93 pounds juice gotten. This juice contains 90 per cent. of the solids present in the 89 pounds of original juice, so that 93 pounds maceration juice represents 14.42 pounds solids and 78.58 pounds of water to be evaporated out. The available fuel in megass contains 11 pounds liquid which retains the balance—10 per cent. of the solids present in the original juice, or 1.6 pounds, so that the fuel is made up of 11 pounds fibre, 1.6 pounds of soluble solids, and 9.4 water.

The heating value of one pound of solids present in cane juice deduced from its chemical composition is equal to .42 of one pound of carbon. One pound of steam in the triple effect will evaporate $2\frac{3}{4}$ pounds of water; and as half of the water in the juice will be taken out in the triple effect, it follows that 39.29 divided by $2\frac{3}{4}$ equals say 14.3 pounds of weight of steam at say 10 pounds pressure required for triple effect, one pound of steam will evaporate .9 pounds of water in vacuum pan; so there is required in this apparatus say 43.6 pounds of steam at 10 pounds pressure. Total steam at 10 pounds required to evaporate water in juice from 100 pounds cane is 14.3 plus 43.6, say 58 pounds in round numbers; but power is required to do the crushing and run the pumps, etc., so if 58 pounds of steam leaves the boilers at 60 pounds pressure, there will be sufficient heat in it to supply the necessary energy to the various engines, and the remainder will be utilized for evaporation. The total heat, from 150 degrees Fahrenheit (hot-well temperature) in steam at 60 pounds pressure, is 1,060 units, so that the amount of heat to be abstracted from the fuel acquired by the crushing of 100 pounds of cane, in order to do the work of crushing and that of evaporating, is 58 pounds of steam multiplied by 1,060 units in each pound, and equals 61,480 units.

The total heat that developed from the megass is as follows: 11 pounds woody fibre, equivalent to 5½ pounds carbon, and 1.6 pounds of solids in juice, equivalent to .67 pounds carbon, or a heating value equal to 6.17 pounds carbon; one pound carbon developes when burned to carbonic acid, 14,500 units of heat, then 6.17 times 14,500 equals 89,465 units. From this must be deducted the heat required to vaporize the 9.4 pounds of water contained in the megass—this may be placed at 11,280 units, so that the actual available heat from fuel is 89,465 minus 11,280 equals 78,185.

Actual heat obtained from fuel, 78,185 units. Actual heat required for work, 61,480 units. Balance for waste, 16,705 units.

One pound of carbon requires for its complete combustion 11.6 pounds of air, resulting gases weighing 12.6 pounds. Furnaces in common use permit from two to three times the necessary quantity of air to pass through the funnel, thus diluting the products of combustion, reducing the heat in the furnace, and increasing the waste going up the chimney. Total heat lost up chimney when no more than the necessary amount of air is admitted to the fuel as follows: Temperature in chimney 450 degrees Fahrenheit; 6.27 pounds carbon plus 72.73 pounds air equals 79 pounds gases; heat required to raise the gases from 80 degrees Fahrenheit to 450 degrees Fahrenheit, say 7,020 units. Heat lost up chimney with a double supply of air to fuel, and same temperature in chimney equals 13,470 units. Heat lost up chimney with a treble supply of air to fuel, and same temperature in chimney, equals 19,930 units. It has been shown that an actual balance for waste 18,155 units of heat remains after deducting the heat required in the boiling house, but it is also shown how easily this balance can be eaten up by a poor construction of furnace; with natural draft, and under the best circumstances, a double supply of air will get through the insterstices of the fuel, consequently a waste up the chimney of 13,470 units to every hundred pounds of cane crushed, leaving a balance to allow for condensation and radiation in pipes and apparatus of 4,685 units, which is little enough.

It will now be plain that attention to the condition of the furnaces as to air supply is of paramount importance; with a

sufficient quantity of air and no more, the margin of heat in the available fuel is more than enough to do all the work required in our sugar houses, even if heavy maceration or diffusion is used in extracting the sugar; and the time is coming, and not far distant, when the diffusion plants in Hawaii will be run without the aid of coal or wood.—*Sugar Cane.*

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IMPROVEMENT OF CANE SEED.

EDITOR PLANTERS' MONTHLY:

I have read with pleasure and I hope profit the communication of Mr. A. Moore, printed in January PLANTERS' MONTHLY, upon improving cane seed. His theory seems so reasonable and natural, as all breeds and all seed (except cane) have been improved by man, but it has taken patience and intelligent application to make the various improvements more enjoyed by civilized man, and constant care to retain an improvement from deterioration after it is made.

Witness the progressive farmer in his endeavor to prevent his favorite corn from deterioration. In selecting his seed for the coming year, he goes through his ripened corn and selects the largest ear from those stalks bearing two or more ears, thus securing the most prolific as well as the most perfect for his seed. After it is husked, he examines the pile and rejects every ear not true to kind. One unacquainted would think that sufficient. Not so the farmer. He now takes every individual ear and shells off all of the small undeveloped grains usually found upon both ends of the most perfect ears. What remains is his seed. With this care only can he hope to prevent the most valuable varieties from deterioration.

"Yes," you say, "that is easy, there is seed to improve, the cane has no seed to work on." This I will not argue, although I have seen sugar cane seed.

Well, let us take the grape. Yes, it has seed, but the seed is only used for producing new varieties. To keep it healthy and prolific, the best, firm, ripe fruit vines are selected for the new planting; not the sappy, spongy, large sprout growth, nor the unripe part of the best fruit wood, nor yet the old degenerate wood; none but the best ripe part of the best fruit

vine is selected for future use by intelligent vineyardists for maintaining the quality and productiveness of favorite varieties.

The best seed of improved varieties is always sought by market gardeners; and seed raisers are very particular that none but the best seeds and plants, true to name, be sent out, knowing full well that customers would drop them if they did not get the kinds paid for. This course holds good with the nursery man; he must have the best stock, and the best grafts and buds from the most healthy trees of the best varieties of fruit.

And with the improvement of live stock this same rule also holds. The farmer's creed runs:

> "With stock, search out the choice breed,
> In peace and plenty let them feed,
> Your land sow with the best of seed
> And you will soon," etc.

As I understand Mr. Moore, we start this year by planting a field expressly for next year's seed. The seed to plant it with must be the thriftiest and most sugary canes to be found on the plantation. We must not stop there, but take the most sugary part of those best canes for our seed, planting neither the unripe top nor the bottom of the canes.

The following year we go to our seed-field, not only for our seed for the plantation but for our seed for planting our seed-field for next year's planting, and select from there, as we did the first year from the plantation, the most likely and most sugary canes, and the most sugary part of the sugary cane for our seed-field planting, and so continue year after year. This course should certainly improve the quality, and perhaps the quantity of our canes.

There arises one fear of failure. Cane thus planted and cared for will be large and thrifty at one year's growth. I have found, to my cost, that such canes are not a reliable seed; others have likewise suffered. My neighbor, Mr. Notley, planted a large field of this kind of large, thrifty cane. It come up so poorly, he told me, it cost him ten thousand dollars to replant which he did twice with this same seed and still there was much missing.

Cane of one year's growth, if thrifty, seems deficient in

generative power. The fear above expressed may be avoided by planting the seed-field on such part of the plantation where cane does not tassel. Such lands are found low down on some plantations and high up on others. On such spots cane could be planted in February or March instead of May or June, and thus secure two, three or more months' older seed.

When compelled to plant thrifty canes of only one year's growth, something may be gained by topping each cane a few days before planting. This will force a more perfect ripening and development of buds and start the growth quickly.

Mr. Moore's theory worked out would undoubtedly prove whether the sugary properties of cane can thus be improved, and whether our present careless, unenterprising method of planting green tops, stunted and short-jointed canes these many years. has caused the small yield of sugar complained of from heavy yields of cane and what appears to be rich juices.

Mr. Moore thinks, and perhaps correctly, that our present methods of collecting seed have encouraged the increase of gums, invert sugar, and other heavy juices in our canes at the expense of genuine sugar. We have planted seed containing sugar, we are now reaping our reward.

Some mills, with the same sugar boilers, are now getting thirty or more gallons of molasses to every ton of sugar, where formerly they got less than sixteen. Formerly, we had poor extraction and no No. 4 sugar, now we get No. 4 sugar and much better extraction, and for that reason should get a larger yield of sugar from a ton of cane, which does not appear to be the case on all plantations.

It will be a phenomenon in nature if all breeds and all seeds can be improved except sugar cane.

J. M. Horner.

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From the fact that the sugar crop of Cuba is estimated to reach this year an increase of 100,000 tons over last year's product—it is safe to infer that the Cuban growers of sugar cane find a profit in their business, even in the face of an increase in the manufacture of beet sugar.

BANANA CULTIVATION IN FLORIDA.

CORRESPONDENCE "FLORIDA AGRICULTURIST."

It is the belief of the writer that bananas cannot be profitably raised as an article of commercial export in Florida between latitudes 28 degrees and 31 degrees; certainly not farther to the northward. Still, as there are said to be exceptions to all rules, so there are to this special one. Mr. Tuesdil some six years ago or more, selected a spot of ground on Lake Nona, some three miles out of Sanford. The results given are for a period some three years ago, when the area planted was under his own care.

The soil selected, one-third of an acre only, was pure black muck, reaching to an unknown depth, covered in part by water from fifteen to thirty inches in depth. A thorough system of drainage made it suitable for the purpose. The variety, set out four feet apart each way, was the Dwarf Cavendish, with a pineapple planted in the centre of each square—the latter being of the Strawberry, Egyptian Queen and Sugar-Loaf varieties. The first crop of bananas matured the second year from planting; but it was the third year before the ensuing results were attained. That season he realized $600 gross, with expenses not exceeding $50, no fertilizers being used, which would have been necessary with vegetables to have taken the acidity out of the land. At the above rate $1,800 could be made on an acre, with an expense of $150, leaving a margin of $1,650.

A little farther south, or near Orlando, in Orange county, a result very similar was reached by Dwight D. Porter, Esq., who, season before last, devoted half an acre to the culture of bananas, planting them in six feet apart in the rows, and the rows ten feet apart. This gave at the rate of 500 plants to the acre, or half as many for the half acre planted, or it may be said in this case from 250 to 300 per half acre. There was also 500 pineapples planted among these bananas.

BANANAS GROWN IN FLORIDA.

The varieties of bananas chosen were the African, Cavendish and Hart's Choice, of which the Cavendish is rated as the best. Mr. Porter considers the Hart's Choice as a shy bearer with small bunches, consequently less proceeds, and

that they recover more slowly from the effects of frost, say six weeks or two months—a rather harsh judgment not usually borne out by the facts of the case. Mr. P. realized, during the season in question, from $300 to $400 on this half acre, and thinks there should be, ordinarily, not less than $400 per acre made if the location be good, thus by inference admitting his to be an exceptional case, even in his own estimation. But then the pineapple account, the proceeds from which were not recorded separately, were included in the foregoing receipts.

Three or four years ago, he also realized on plants and fruit $300 on half an acre, but the succeeding seasons, until the one noted above, not nearly so much, as the climatic conditions were unfavorable. One bunch of bananas the past season, but one, had 225 fingers; others did nearly or quite as well.

The kind of soil is a dark, adhesive muck in a low, well drained location, though still, where the bananas have free access at all times to plenty of water, in which they fairly revel. A peculiar feature of the business as conducted by him, is that he digs them up and changes their location about every two years, fully convinced of the advantage in so doing; but in this, public sentiment among prominent banana growers is directly to the reverse, as they think that much more is lost by the operations than is gained.

He found a ready home market for them, realizing the figures given above. We have no data as to fertilizer used nor mode of culture, except in general terms, to be cultivated much as corn once or twice, when the broad tropical leaves will effectually shade the ground too much for the growth of weeds.

Bone and hard wood ashes were used at the rate of about 400 pounds to the acre, together with a small amount of hen droppings compounded with muck September, Mr. Porter considers the best time for planting. Some of his Cavendish plants produced leaves three by six feet in size, with bunches selling at $2 a piece; this, with 400 plants growing on an acre, presents an important possibility to Florida fruit growers, even as far north in the State as Orange, Lake and Hernando counties, where the danger from frost is not to be ignored.

The results we have given as to success in banana culture above 27 degrees, north latitude, are indeed rare—the combination of favorable climatic conditions, suitable soil and the necessary skill required being so rarely found in conjunction that the business of raising them in the latitudes named cannot be generally a profitable one, as the banana, though of very rapid growth, is so extremely sensitive to frost as to have its foliage, though not its stalk, killed every winter by the cold, even partially so in the favorable water-protected localities above indicated. The recovery from the effects of this cold, although very rapid, are not sufficiently so to induce fruit in the abundance and perfection seen some two or three degrees farther south—and still more so in the regions of Central America and the West Indies.

Now let us see how the banana plantation of W. A. Baugh, on Indian River, at the "Narrows," in latitude 25, and from 40 to 60 miles below Rockledge, flourishes, for it has been a notable success, and the farthest north in Florida that invariably produces a good crop—often a very large and phenomenal one. An interview with M. Baugh elicited the following facts:

The plantation consists of a long, narrow strip of land, commencing above the Narrows and extending some distance down them, but at no portion visible from the river. The place was originally hammock land, cleared and planted seven years ago. The heavy growth of oak and palm trees on it was cut and piled up in winrows thirty feet apart and then left to rot down, after which the debris was spread over the ground. The plants were put eight feet apart, but, considering the way they spread and the nutriment drawn from the soil, they should be at least ten feet apart. Nothing better has been found for fertilizer than bright cotton seed meal. Bone meal will not do, for the banana, being a rapidly growing plant needs a quick stimulant, though the effect may be soon over and frequent renewals required.

THE CAVENDISH BANANA.

The Dwarf Cavendish banana is given the decided preference on this plantation. Unlike the "horse" banana, it requires constant care and good treatment, for it is of "noble

blood" and is more fastidious than other kinds, but well repays all the attention bestowed upon it.

The Cavendish is, in fact, the very king of the banana species, being preferable to all others for eating and marketing. Being of dwarf habits, it does not reach more than six or seven feet before it begins to bear. In summer the fruit should begin to ripen within three months from the time of blooming, but as autumn advances the time is lengthened to four months. Were it not for our Florida frosts there would be no end to the banana season, and ripe fruit could be cut from the plantation every day in the year. If that were the case the banana business would overshadow everything else in the State, but, as it is, there is big money in it.

The fruit is cut as soon as it begins to fill out and get rounded. When quite young it is quite angular and has a sort of three-cornered shape, but as soon as it begins to get round the head is cut. Too much cannot be said in praise of this right royal fruit. No knife is needed in getting it ready for eating. Its soft, golden skin is ready at a moment's notice to part from the fragrant meat; it comes away without an effort, leaving no stain, and the most fastidious lady needs no handkerchief in eating a banana, for it is most emphatically a "kid glove" fruit. In the southern end of the Florida peninsula, they grow and ripen at all times of the year and are eaten by all classes of human beings.

The profits of a banana plantation are immense. Mr. Baugh thinks that on suitable soil, with proper climate and when given the best care and cultivation, they ought to yield an annual income of $1,000 an acre. That, however, may be regarded as the best figure. But a plantation in South Florida, say near or below Melbourne and Sebastine on Indian River, in the approximate vicinity of which Mr. Baugh claims to be, should produce 1,000 heads to the acre at 50 cents per head, or $500, exclusive of expenses. To those who run the matter aright there are golden possibilities in banana culture in South Florida, from at least 27½ degrees on down southward in a steadily increasing ratio.

In making a success of it, there is no particular secret, art or legerdemain. It consists, first, in proper soil; second, in reasonable exempture from frost; third, the right kind of

fertilization, and, fourth, the requisite care and attention. The latter, in a word, may be said to embrace all the other conditions. Then it will pay well, looking closely to the fact that the soil is naturally moist but without any dead, standing water.

The inferior variety known as the horse or Orinoco banana, on the contrary needs no special culture. It grows and fruits right along without being looked after, in one instance, fifteen years on the same ground, and was never, in any way, disturbed, until some one came along to cut off the heads. But it is not the variety best to raise.

Referring again to the Cavendish, it may be said that Mr. Baugh obtained his plants, some from the Bahamas and some from Washington, and has been steadily propagating them for over six years. Each plant should send up three new ones every year. There need be no fear of a glut in the market even with the enormous and rapidly increasing production of the West Indies and Central America.

As to a minor peculiarity of the banana, it may be added that when one end appears black many people think it is not fit to eat. But when it rots, it rots all over, not on the black end, which was caused when the fruit was young by a leaf lying against it, and does not hurt it at all; on the contrary, it gives it a better flavor.

By way of ornament, except in height, the Cavendish banana has the merit of being the most beautiful of its species. The leaves of the young plants are dotted and splashed with crimson; they are comparatively thick in texture, thus being able to withstand better the force of the wind, and not be blown into ribbons, as others are. This, with fruit liberally produced, and the finest flavor of any in Florida—are some of the points that commend it, in addition to what has already been said, to popular favor.

The banana bears a high recommendation as an article of food, because of its nutritious character. It is affirmed, on good authority, that one pound of this fruit has more nutriment than three pounds of meal, or as many of potatoes, while as a food it is reputed to be in every way superior to wheaten bread. The natives of the West Indies live largely upon them, and a certain noted writer makes them a special

and exclusive article of food when he has worked, requiring laborious thought and accuracy, when a regular meal and other food would weaken the action of the mind. It digests easily, and makes no diminution of mental concentration, while, at the same time, the needed sustenance of mind and body is obtained.

BANANA FIBRE.

The fibre of the banana may be readily utilized, and it is among the valuable products of the land now suffered to go to waste. This fibre may be divided into threads of silken fineness, extending the length of the body of the tree, which, in other cases than the Cavendish, grows from ten to twelve feet high, with a circumference at the base often of eighteen inches or two feet, sometimes two and a half and three.

In Central America, this fibre, with no preparation except drying, is used for shoe strings, lariots, cords and other purposes. In its existence of twelve months only, the banana tree bears but one bunch of fruit, but from the base of which spring from two to four, and sometimes ten new ones. In its native haunts, Central and South America, the bunch of bananas is worth ten cents.

In the location of a banana plantation good judgment must be exercised. The soil should be of a character to enable it to hold moisture (not dead, standing water) a long time, which is the right soil to appropriate and render speedily soluble the fertilizer applied to it. The south side of a lake, which the coldest winds, except in moderation, do not reach, is preferable to all other situations, especially if near enough to a stream of running water to give the plants a plentiful supply in their sheltered position from the high winds, and in a gentle slope towards the afternoon sun.

The splitting of the leaves by the high winds materially injures them, and a failure to fertilize decreases the crop of fruit. We give herewith the enthusiastic and rather poetical description recently appearing in print and written by one of Orange county's brightest sons: "Nothing could look more richly tropical than those Cavendish banana plants, lifting their abroad, light green flags in the evening sunlight, and lazily fanning themselves with the breeze from the lake; a solid phalanx of rich greenness, such as no green-house of the

northern millionaire could ever hope to boast of. As we went among them, a warm breath, laden with a heavy but not unpleasant odor peculiar to the healthy banana plant, greeted us, and we could see the scarlet 'bobs' and long heads of fruit hanging in the shade, some of them so heavy that the stout stalks bent half-way to the ground. Some of these bunches contain more than two hundred bananas, and none have less than a hundred. The stalks are from six to twelve inches in diameter, and stand about six feet apart. Around every stalk could be seen the fat young suckers, with their crimson-spotted leaves. It is so shady and leafy in there that one can almost get lost among them."

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RAMBLES AMONGST SUGAR CANE IN FIJI.

CORRESPONDENCE OF "THE FIELD."

The excursion in Fiji which presents the most attractive features to the tourist is a visit to that noble stream the Rewa river, both in its lower and upper course. The distance is short (only some fifteen miles from Suva, the capital), and the means of communication easy and various.

Starting from, say, Sturt's Club Hotel (the hotel *par excellence* of Fiji) on a nag from the stables of Smith & Co., the visitor on leaving the town first ascends a gentle eminence, and then proceeds along the Tamavua road, winding along the ridge of the hills which skirt the coast line amongst some beautiful tropical jungle scenery, interspersed with the pretty villa residences of some of the principal official, professional, and commercial residents of the city.

Along the whole length of this nicely-formed highway, constructed partly by the town board of Suva, and partly at the expense of the Government of the colony, which is still that of a Crown colony of the severe type, by prison labor, some beautiful views of the surrounding country can be obtained. To the right, looking over brilliantly green mangrove flats, is the sea beach; and beyond this, at the distance of half a mile or so, is the shore reef, the black points of which show up at intervals above the surface at low water. Beyond this, again, as far as the eye can reach, extends the lovely azure blue of the grand but limitless Pacific Ocean. Amongst

such surroundings as these the rider proceeds for about three miles from the town, that being the distance to which the road is so far completely formed. He has now reached the Tamavua, and thence towards the Rewa, the dense forest and undergrowth has nearly been cleared, but no road has (although the colony has been in existence sixteen years) been formed—a striking proof of the non-progressive and ruinous policy pursued in some of our Crown colonies. A good bridle track has, however, been made, and is kept in good repair for a distance of seven or eight miles, when the native village of Kalaba is reached. From this point the main track continues over the flat land adjacent to the coast until the sugar lands of Koronivia, an extensive sugar estate, at present in the hands of the Messrs. Fraser & Co., Limited, of Melbourne, Victoria, is reached. Just beyond Kalaba, however, a branch track of easy access leads to the banana plantation and cattle ranch of the Messrs. Koster, an enterprising firm of German pioneer settlers, who have done much to improve and beautify their valuable homestead, where they have resided, father and son, for some twenty-five years. Adjoining this, further up stream, is the plantation of Na Bula, also devoted to the cultivation of that excellent and profitable fruit, the Chinese banana, or, as the aborigines term it, the *vudi tiana*, for export.

Below Navutoka lies the extensive properties of the Mortgage and Agency Company of Australasia (now in liquidation), at Geri Geri, under the management of that skilled agriculturist Mr. A. Amos. a gentleman from Tasmania, who has spent a long while as superintendent of this valuable estate. During the last ten years numerous nurseries of coffee, tea, cocoa, cacao, chinchona, the kola or cocanut, vanilla, sisal hemp, and various other tropical plants of commercial value have been made, and afterwards the young seedlings have been separated, planted out, and carefully attended to until maturity. They have recently been somewhat neglected, owing to the straightened financial position of the company; but, notwithstanding this, the various plants evince surprising vitality, showing clearly that in Fiji exists favorable conditions, of both soil and climate, suitable for the growth of every description of tropical produce of this

kind, for which such a ready and convenient market exists in the adjacent colonies of Australasia, not to mention those all-devouring and insatiable emporiums, the cities of Europe and America.

Following the Waimanu river from Geri Geri down to its junction with the main river just opposite to Nansori, the centre of the operations of that wealthy syndicate, the Colonial Sugar Refining Company in Fiji, one passes on the right hand side portion of the plantation of Burlton, leased by Mr. T. B. Matthews, and on the other side of the river are situated several native towns and villages, also the nursery of Mr. J. P. Storck, a skilled botanist.

At the junction of the two rivers Waimanu and Rewa, situated on the left hand side of the former, is the native town of Nownse, where Ratu Ravulu, the Buli of the district, resides. On the opposite point is situated a comfortable and well conducted hostelry, the proprietress of which is Mrs. Shawe, a widow lady who provides most carefully for the welfare of her patrons, and who is already acquiring for her house a world-wide reputation for excellence.

The far-famed Nansori Mill of the Colonial Sugar Refining Company, Limited, the largest sugar mill in the world, is situated on the left bank of the Rewa river, just below the confluence of the Waimanu and nearly opposite the site of the hotel. Visitors to the mill are conveyed across the main stream, which is here about 400 yards wide, by boats plying to and fro between either shore. Between the crossing place and Nansori and about half a mile below the former are situated two stores, which are all that remains of the once vaunted township of Elliston. Another half mile down stream and then the first point of the extensive establishment of the Colonial Sugar Refining Co., at Nansori, the coolie lines are reached. These consist of a series of rows of wooden, iron-roofed barracks, capable of accommodating the two thousand Indian coolies and other colored laborers which are employed on the estate. Past the coolie lines and still on the bank of the river, the next erection come to is the sugar mill itself, with its three gigantic red iron chimneys towering as land marks. The building is of corrugated iron, and is of immense extent. It contains some of the heaviest machinery

ever constructed for this purpose, with which the sugar cane grown on the company's numerous plantations on the river is crushed, and the juice converted into the raw sugar of commerce. The whole process of manufacture is here to be seen in all its stages, and the visitor will, by the courtesy of the genial manager, the Hon. James Robertson, or "Saccharine Jimmy," as his intimate friends jocularly term him, be thoroughly instructed into the mysteries of sugar boiling by one of the experts employed in the mill. Crushing goes on during the season, from July to January, without intermission night or day, from 6 a. m. on Monday until 12 p. m. on Saturday, and the mill, when illuminated by the electric light at night, presents a very grand *coup d'œil.*

The visitor will, after inspecting the mill, frequently be afforded an opportunity of descending the river on his return to Suva in one of the many fine and powerful launches owned by the company, but a description of this portion of the excursion must be postponed. J. B. C.

Lancala Bay, Suva, Fiji.

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CINNAMON.

The Cinnamon tree *(Cinnamomum zeylanicum)* is a native of the East Indies; it is usually of small size, having leaves with three to five strong nerves and small yellowish flowers.

The best kind of cinnamon bark comes from Ceylon, where it is grown near Colombo from the sea-coast up to an elevation of 1,500 feet.

Soil.—A sandy soil is generally preferred, but red and chocolate colored soils are also utilized when free from gravel and rock.

Cultivation.—The seedlings three months old are planted out 8 or 10 feet apart. After two or three years the young trees should be cut down to about six inches above ground; and the "garden" is treated similarly to an oak-coppice in England.

Harvesting and Curing.—From the stocks or tools, four or five shoots are allowed to grow. "These shoots usually come to perfection at the age of from eighteen months to two years, when they are beginning to turn brown on their sur-

face from the greenish epidermis becoming replaced by the production of a corky layer of bark. Such shoots, which are commonly from six to ten feet high, and from half to two inches thick, are then cut off by a long sickle shaped knife, called a *catty*, stripped of their leaves, and trimmed with a knife, the little pieces which are removed being kept and sold as *cinnamon chips*. The peeling is then effected by cutting through the bark transversely at distances of about a foot, and by making two opposite or where the branch is thick, three or four longitudinal incisions to connect with the transverse ones, and the bark is then readily removed by introducing the peeling knife termed a *mama* beneath it. The pieces of bark are then placed one within the other, and the compound sticks thus produced are bound together into bundles. These are usually left for about twenty-four hours, when the two external layers of bark are carefully removed by scraping; for which purpose each quill is placed on a piece of wood of the required thickness. In a few hours the smaller quills are introduced into the large ones, and in this way congeries of quills are formed, which generally measure about 40 inches in length. The bark is then kept one day in the shade after which it is placed on wicker trays and dried in the sun; and finally it is made up into bundles weighing on an average about 30 pounds each. Care is taken to fill up each pipe or congeries of quills with the same kind of bark as that which is outside, and as few joints are placed in each pipe as possible. The finest pipes are usually well filled, as the preservation of the odor and flavor is very much assisted by the exclusion of the air."—*Bentley & Trimen.*

The peeling process should be done during the wettest seasons of the year, when the bark comes off easily. The bark peeled from the middle of the shoot is considered the best kind. A second quality is the bark from the ends of the shoots, and a third from the base. It is advisable to keep these qualities separate.

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Save oil where you can, but don't save it at the expense of a cylinder. The value of a half pint of oil daily will not begin to equal the cost of boring out a cylinder.—*The Safety Valve.*

MR. A. SUNTER'S EXPERIENCE WITH LADY BIRDS ON HIS COFFEE PLANTATION.

HILO, HAWAII, March 19, 1892.

MR. EDITOR: Dear Sir:—On seeing Mr. Meyer's letter in the *Gazette* and *Advertiser* in reference to Mr. Koebele and the lady bird, I had prepared a letter to you on the subject, thinking I had made an original discovery, when on awakening one morning, and taking up the last *Gazette*, I found the ground cut out from beneath my feet, that it was not an original discovery on my part at all, but that the same discovery had been made by others on the Island of Oahu.

I have had under my observation for the past two years, or more, an insect, presumably a species of lady bird, which to my certain knowledge does destroy the white aphis, which has been until lately so destructive to coffee trees. I have watched it repeatedly seize and devour the aphis, but I do not consider that it is a very hardy insect, or that it multiplies rapidly, probably on account of the ants. There seems to be a natural antipathy between the lady bird and the ants; but still it is increasing slowly and surely, and I have great hopes that within the course of a few years, it will have multiplied to such an extent, that the aphis will be a thing of the past. I find the lady bird over every part of my coffee plantation. I have also found it in the town of Hilo, and I have frequently called the attention of people to the presence of the insect. I believe the insect will be found everywhere, if it is searched for. It is a well known fact that the ravages of the aphis have been growing lighter from year to year; that it is, in fact, disappearing in certain localities, and I believe that this lady bird is the cause of its gradual disappearance. Places that were formerly badly infested with the blight, have almost ceased to have it now; notably the District of Puna, where a stranger would pass by without seeing any evidences of blight, or that it had ever been there.

I have great hopes for this newly discovered lady bird, but at the same time we should not depend solely on this particular variety. Mr. Koebele should be invited to co-operate. Perhaps with his superior knowledge and experience, he may

succeed in finding a more hardy insect, and one which multiplies more rapidly, and which would make short and sharp work of the coffee aphis, like his discovery which destroyed the "Cottony Cushion Scale." It should be the duty of the Legislature to employ Mr. Koebele, if possible, for a season to assist in this matter, as individual planters have as a rule, neither the time, skill, nor appliances to investigate the subject properly; but it is possible that the honorable members will not do so, as they may not consider it a proper subject for legislation. The real duty of a legislator in the opinion of many, is to look out for private interests, getting fat appropriations for local enterprises, helping influential friends, and increasing the taxes and salaries.

Washing and spraying the trees with chemical compounds is expensive, and the effects are not lasting as witness the efforts of the California fruit growers in that direction. The proper way is to "fight fire with fire." A back fire started will kill a prairie fire. The mongoose destroyed the rats, and Prof. Koebele's lady bird destroyed the Cottony Cushion Scale.

Yours truly,

A. Sunter.

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A NEW SUGAR PROCESS.

A new method for making white sugar from beet juices is worthy of attention. The first stages of the operation do not differ from the customary processes of manufacture. Difficulties of graining in pan depend upon purity of syrup used; the operation may be hastened by adding pure sugar to syrups; crystallization then rapidly follows. In the new process, graining in pan commences with a pure sugar syrup, and is progressively continued with syrups of decreasing purity. Syrups in quadruple effect are concentrated to a far greater density than by existing methods. The syrups are poured over a *masse cuite* that has been entirely freed of its molasses by a suction pump.

Syrup adhering to crystals is washed off with a pure-sugar solution; this latter, like the former syrup, is run, during various periods of the operation, into special reservoirs, according to its specific gravity. The washing continues until

syrup drawn from the *masse cuite* has the same purity as it had upon entering the receptacle containing the product being washed. These crystals may be re-melted and grained in pan for the second time, and they will then give a pure white sugar. All the foregoing operations are repeated by using progressively in pan the drained syrups that have been divided into at least ten parts. The *masse cuite* obtained is then washed with fresh concentrated syrup from quadruple effect, etc.—*The Sugar Beet.*

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SEEDLING CANES IN MAURITIUS.

At a meeting of the Mauritius of Agriculture, held on the 14th December, 1891, under the presidency of Mr. F. Nash, and attended by the Vice-President, the Hon. L. de Rochecouste, the Hon. H. Leclezio, the Hon. Sir Virgile Naz, and many of the leading planters, chemists and others interested in the staple industry, Mr. G. Perromat exhibited ten baskets containing plants of the sugar cane raised by him from native seed, at Clemencia and at Quartre Bornes. It is impossible, said Mr. Nash, to exagerute the importance of this event, which will undoubtedly be the beginning of an epoch in the history of the Colony.

The plants exhibited, which in some cases are throwing out vigorous shoots, form part of some 700 successfully raised by Mr. Perromat, of which 288 only have escaped the ravages of insects. Mr. Perromat kindly announces that his plants are open to inspection at his residence at Quartre Bornes.

The President of the Chamber of Agriculture congratulated Mr. Perromat, for the Colony, on the conspicuous success which he had achieved, and hoped that other planters may be stimulated next season to further efforts for this most important object.

The following is the report of his experiments presented by Mr. G. Perromat:

The Chamber of Agriculture, under the presidency of Mr. F. Nash, the manager of the Oriental Bank Estates Company, Limited, having actively interested itself in the question of growing canes from seed, I decided to undertake some experi-

ments, and considering the small proportion of seed obtainable from each flower stalk, to make those experiments on a large scale, so as to increase my chances of success.

Last year, I covered with muslin about a dozen flower stalks of each variety, after having, as a preliminary measure, powdered them with the crushed sprays of flowers which must necessarily contain the pollen. By this means, I thought, firstly, to cause artificial fecundation, and next, to retain the seeds which are otherwise generally carried away by the wind. The sowing, made in September in pure leaf mould, and comparatively but lightly watered, was unsuccessful.

This year, in the month of June, I began to gather the flowers of every species in the low and hot localities such as "Clemencia," "Tamarin," "Wolmar," "Beau Champ," and "Riviere Creole." In the annexed table, I have given all the information collected by me, and it can be seen therefrom that I made at "Clemencia" five consecutive sowings without obtaining a single plant; whereas my first sowing in a conservatory at Quartre Bornes gave my first plant towards the end of July from the seeds of the Bambou variety. The sowings were always made in the same manner:

1. In prepared soil (earth and leaf mould), baked on a large sheet of iron heated red hot, so as to destroy all foreign seeds.

2. Under a shelter shed, facing the setting sun, roofed with sheet iron and provided with a veil of sail canvas, so as to protect the seeds from the setting sun before germination.

3. With copious waterings, especially before the sowing, so as to maintain the greatest moisture possible, and sprinkled over the surface or lightly powdered with fine earth.

4. The flowers have always been gathered in the same way, at the moment of complete maturity, yet, nevertheless, I have noticed flower stalks a portion of the seeds of which sown in July did not germinate, whereas the other portion sown later on in September have germinated.

I have always been careful to remove completely all the flowers from the stalks, in order that the coating of the seeds might come into closest contact with the damp soil.

It is sometimes difficult to find flowers bearing seeds, even on well matured stalks. Several seeds which I have found thus with the aid of a microscope and of a pair of small

tweezers have germinated in my conservatory at Quartre Bornes.

The growth of cane seeds is very characteristic, and cannot give room for mistake, because the germ which is seen issuing from the seed envelope is of an elongated horn shape, which does not detach itself until after some days, because the seed, as in the case of the gramineous plants, is fixed by its extremity to the ovary wall.

In conclusion, I find I can count to-day—

185 plants at "Clemencia,"

102 plants at my house at Quartre Bornes.

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287 plants, which have from 12 to 224 inches length of leaf, according to the sowings, and of which 125 have already given vigorous shoots at the base. From now, it is easy to recognize the white, red or ribbon canes according to the color of the sheath of the leaves, and of the leaves themselves. Several plants at Quartre Bornes have the heart dark rose color, and the opened leaves have white longitudinal stripes.

It is a matter of regret that so many of the plants were destroyed at "Clemencia" by slugs, the injury being done during one week, the interval between my visits. Since I have transplanted into small cases, I have lost no more. All the plants are now growing in baskets eight inches in size, and are in excellent condition.

The Sugar Cane. G. Perromat.

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PRODUCTION AND CONSUMPTION OF VANILLA.

The *Journal of the Society of Arts*, of London says that Paris, London and New York are the markets of the world for vanilla. After these, says Consul Knowles, of Bordeaux, that city occupies an important place. Great quantities of the bean are used in France. It is employed in making confectionery, ices, liquors and cordials, and enters into the manufacture of perfumery. Vanilla is of Mexican origin, though found in almost every tropical country. It is a vigorous rind of the orchid species, about twenty to thirty feet in

height, with heavy, oblong, sea-green foliage. It thrives in dense forests, where its branches entwine and interlace themselves in the neighboring trees. The stem is four-cornered, the flowers large, fragrant and spikelike. It yields to cultivation. The greater part of the vanilla imported into France comes from her colonies—Guadalupe, Madagascar (Sainte Marie), Mayotte, the island of Reunion and Tahiti. The production in 1889 of vanilla in these colonies amounted respectively to 9,000, 19,000, 19,000, 506,000 and 7,000 pounds weight. The vanilla vine begins to yield in its third year, and from thence to its thirtieth. The season commences in the month of April and lasts until the middle of June. The beans are gathered in the green state before maturity. There are two existing methods of curing vanilla. In the first of these the beans are laid in quantities on great cloths spread upon the ground, and exposed to the sun for a period of two months, or until they have attained a dark brown color. They are then packed in bundles of fifty, and placed in tin boxes for exportation. The second method consists in attaching by their inferior extremities a number of the beans, and immersing the same in a vessel of boiling water until they become white. They are then exposed for a few hours only to the sun, after which they are covered with a native fixed oil, usually that of the cashew nut. There are four qualities of vanilla, and these are determined by length and size of the bean, it being found that the flavor and perfume are in direct ratio to their weight and measurement. In appearance the beans are slender and cylindrical, averaging about five or six inches in length and half an inch in thickness. Within is a soft black pulp. The quality of the bean is further enhanced by the exudation of a certain needle-like crystal or efflorescence which covers the surface of the bean, and is called in French *vanille givree.*

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The last steamer of the Royal Mail Line left Port Limon for England with twenty thousand sacks of coffee, the largest shipment that has ever been made from Costa Rica, and more coffee was offered than could be taken by the vessel. The large increase in the export of coffee and other products is attributed to the opening of the new railway, on which trains are now running regularly.

AGRICULTURAL CUBA.

CORRESPONDENCE N. Y. "INDEPENDENT."

Cuba is a country that in most things has remained far behind the times. Sugar making, however, is an exception to this generalization, for many of the large plantations are up with almost every improvement in the methods of planting, handling the cane and extracting the juices, except the single and greatest one of substituting the diffusion process in the place of crushing. So far as I have been able to learn, there is but one diffusion plant in the island.

The plantations, which measure their product by the millions of pounds, of course extend over a considerable territory. The dark-green foliage of the cane stretches away in fields that are measured, not by acres, but by miles. To facilitate the handling of the cane at harvest time, railways extend to different parts of the plantation and the cane, loaded upon open cars, is drawn by mules to the sugar house. Where the railways do not reach, the cane is loaded upon huge carts, and these are drawn by four, six and even eight oxen. There is not the same rush manifested in the work there that we see in Louisiana, because the grinding season extends over several months instead of being limited to a few weeks by fear of frost, as is the case in Louisiana. Yet everything moves with well-ordered dispatch, and good work is secured from the motliest throng of laborers that could possibly be gathered. Negroes, coolies, Indians and whites, men and women together, dressed in garments of every hue and description, or undressed almost to the last vestige of ragged habiliments, work harmoniously together.

Speaking upon this subject leads me to digress for a moment.

One of the most striking matters that came under my observation in Cuba was the apparent harmony between the whites and Negroes. The Negroes were long slaves there as here, and the dominant race were equally opposed to granting them their freedom. But now that they are free, I looked in vain for any evidence of race prejudice. Whites and blacks work together in every avenue of employment, in both town and country. Not only do they labor side by side in the cane fields, and in the coarser lines of industry, but in the shops

and stores as well. I have seen white and black tailors sewing together upon the same bench, and white and black women working upon terms of perfect equality in the milliners' and dressmakers' shop of Havana.

I have said that in my opinion we do not want Cuba—at present. We do not want her badly enough to impose upon ourselves any burden of taxation for the purpose of obtaining the island, nor for maintaining our sovereignty over it afterward. We do not even want it as a matter of free acquisition. But we do want closer commercial relations with it, and these we are bound to have. Then, after a little time, it will be found that this island, blessed by Providence with a soil and climate that has made it the very garden of the tropics, will offer an inviting field for American enterprise and capital. Then, with such leavening influences, aided by the inexorable march of progress, American ideas, institutions and practices will gradually prevail; and in good time the Americanized Cuba will fall to us as the ripe fruit falls to the ground.

It is four hundred years since Cuba was first opened to civilization, and yet not one-tenth of the island has ever been placed under cultivation. Under Spanish dominion, the selfish policy of the Government has been directly in the way of its development. Take the matter of the introduction of the diffusion process in sugar making. Diffusion involves the necessity of using coal for fuel instead of bagasse—the crushed refuse of the cane. But Spain imposes a duty of $1.72 per ton on coal, and thus blocks the way to the introduction of an improved process that would add thirty per cent. to the output of every sugarhouse on the island. Remove such obstacles and give Americans free access, and they would soon solve the question of our sugar supply.

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There are in Florida alone, over 20,000 persons owning orange groves, embracing an area of 250,000 acres, constantly increasing, and representing an investment of $100,000,000, affording employment, wholly or in part, to 150,000, or more, persons and adding largely to the domestic commerce and railway business of the country. The crop, matures during the months of November, December, January, February and March.