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Raw sugar was quoted in New York at latest date, 3.12 for 96 Cuban basis, and 4.50 for granulated.

A short and terse extract on page 383, relating to coffee culture in Guatemala, states the average yield to be one to two pounds, and the profit per acre at the latter low figure, \$174.24.

The consumption of sugar in the United States for the first half of 1892 was 882,735 tons. It is estimated that the year's consumption will exceed 1,800,000 tons, or one-third of the world's cane and beet sugar crop.

The following periodicals have been received at our office by recent mails: Culture of the Sugar Beet, by H. W. Wiley. Experiments with Sorghum in 1891, by H. W. Wiley. Same with Sugar Beets, 1891. Foods and Adulterants, part 7, coffee, tea and cocoa.

The Waialua plantation on this island has about 700 acres in cane, young and old. Some of it is very fine, turning out five tons to the acre. The crop for this year will foot up about 1,200 tons. All the sugar is made into one grade, and polarizes about 97. This mill is one of the old three roller style, but the skill and ingenuity of Mr. R. Halstead, who is the owner and manager, has so far made it pay its way with a fair margin for profit.

The article on Cinnamon, which appeared in the April number of this monthly should have been credited to the "Bulletin" issued by the Botanical Department of Jamaica. To the same valuable "Bulletin" are due the facts published relative to the cane borer, originally in it, and condensed into *Sugar Cane*, from which we copy the condensed report on page 353.

The Watsonville Beet Sugar Refinery has very largely increased its capacity for making sugar, and will this year turn out nearly double the amount of sugar it did last year. The sugar is refined in San Francisco at the California refinery, and in this way the company secures all the bounty, which is not obtained when the sugar is refined at the factory where made. The bounty is two cents a pound, and on seven or eight thousand tons,—the expected outcome for 1892—will amount to a large sum.

The remarks of Mr. Richard Gird (on page 379), the enterprising beet sugar pioneer of Chino, Southern California, will be read with interest. One remark which he makes is worth the attention of our politicians who are searching for the philosopher's stone. It is this: "There is a general complaint among commercial men and farmers about there being too little money and too little currency. The reason is we send too much of it abroad. If we can grow these things here, we should do so, and thereby keep our money here and give employment to thousands of our own countrymen."

The adaptability of the soil in California to the sugar beet has been lately demonstrated by the analysis made of the beets grown for the Chino Factory in Southern California. A statement is published in the *Rural Press* of 22 analyses made which show sugar contents varying from 14.7 to 19.8, and purity of 81 to 87.8. No beets grown in Europe will compare with these results, and it certainly looks as though there must very soon be a rapid development of the beet sugar industry in America, with returns of \$40, \$50 and \$60 per acre to the beet growers, for their six months labor with the crop.

A report reaches us from Hawaii that the banana plants in Hilo and Hamakua have been attacked by a borer, similar to

the cane borer. It is well known that the banana is subject to attacks of insects, but we were not aware that they were identical with the cane borer. A timely article on diseased banana plants in Fiji will be found in this number, page 348. An investigation there shows that the insect pests were in the roots, and remedies for them are given. The article also states the best mode of treating or cultivating bananas infested with insects, and this will apply to the trouble on Hawaii as well as in Fiji. No pains should be spared to eradicate the pests.

The Kahuku mill, at the north end of Oahu, is one of the most recent of our sugar enterprises. It has three sets of two-rollers, combined with automatic feeders, is doing good work, and proving this to be the best system of mill work, as it allows maceration and the highest pressure obtainable. It is reported to have given an average of \$4 to \$6 for the past season, which means very high extraction. This plantation extends along the shore some eight or ten miles, covering a narrow and rich strip of land between the shore and the base of the mountain. It has some exceedingly fertile land, all of which is easily accessible for transportation. The cane for the coming crop is very fine, and some fields give promise of six to eight tons of sugar to the acre. About 300 acres have been planted this year, making about 1,000 acres now under cultivation. Water is supplied by artesian wells, assisted with frequent showers. The plantation possesses all the recent labor and steam saving appliances, and gives promise of doing good work, with profit to its owners.

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THE COMING ANNUAL MEETING.

We would call the attention of members of the Planters' Labor and Supply Company to the annual meeting which will be held in October next, probably towards the close of that month. The list of officers and the various committees will be found on the last page of this number, with the topics given out for reports. Any subject not specially noted for reports may be taken up, written on and presented by any persons who choose to write. There are always some who make a specialty of certain branches of industry, and who

are capable of bringing out facts of interest relative to them, which may be productive of much good, and prove an incentive to persons who have the means and inclination to profit by them. Just at this time, there are many persons thrown out of employment, some of whom would be glad to engage in new enterprises which give promise of a fair remuneration here, rather than risk seeking employment abroad.

Any topics relating to the industrial prosperity of Hawaii,—whether treating of cane, sugar, agriculture, horticulture or mechanics, or even problems of social or political economy will be acceptable, if presented at the annual meeting. At the present time especially, all the light that can be thrown on our depressed situation, with a view to bettering it, will be received, and may result in more good than the contributor anticipates.

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CANE SUGAR VERSUS BEET.

We have several times had occasion to refer to the popular idea that cane sugar is superior to beet sugar in its sweetening properties, notwithstanding that the two, when pure, are chemically the same, and equally healthy. In looking over our exchanges, we sometimes find references to this fact, which tend to confirm this opinion. The following from *The Sugar Cane* for June, is in the same line:

“*Kuhlou's German Trade Review* refers to the falling off in the exports of sugar to the United States, and adds that the United States Consul at Frankfort declares the reason to be that *beet sugar has less sweetening powers than cane sugar* of the same degree of polarization. While most fully agreeing with the latter part of this statement, which we believe to be an incontrovertible fact, it is news to us to learn that this fact plays any part in causing the decrease in imports of beet sugar into the States. We have always supposed the cause to be that the combination of the American refiners has enabled them to unite in supplying their wants in the nearest producing districts, the West Indies and Demerara, at a lower rate than the European beet sugar producers were willing to accept. This is, at any rate, the reason alleged, and we have heard nothing hitherto to induce us to suppose that the quality had anything to do with the practical exclu-

sion of beet sugar from the North American market which has characterised the last few months. *Apròpos* of the relative sweetness of the two kinds of sugar, which are chemically indistinguishable when pure, we have pleasure in recalling a remark of the *Prager Zuckermarkt*, last September, to the effect that the Mauritius product is *sweeter than the European kinds.*"

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HOW TO INCREASE THE SUGAR YIELD.

The closing of several plantations during the present year furnishes the strongest evidence of the disastrous effects of the American tariff known as the McKinley bill, on the sugar industry of Hawaii, which is now on the same footing as that of other countries supplying the United States with sugar. Yet Hawaii possesses special advantages over some cane growing countries in the larger yield obtained per acre, and in the more uniform crops secured in a series of years. She does not suffer so often nor so disastrously from droughts and hurricanes, nor from destructive insect pests, as some other sugar countries. Yet with all these advantages, derived chiefly from favorable location and other natural causes, every planter sees and feels the necessity of the most rigid economy to adjust his surroundings to the new order of things which are forced on him after fifteen years of plenty, under the fostering policy extended to Hawaii by America, under which have been built up some of the finest sugar estates to be found in any part of the world.

Possessing then, the advantages referred to, there is every encouragement to work with increased zeal to secure the largest crops obtainable with a given amount of labor and expenditure. If a plantation which has averaged three tons to the acre at a cost of \$200,000 a year, can, with the same annual cost raise its average to three and a quarter or half tons per acre, the gain will be apparent at the close of the year with an increased balance to its credit. The man who says "it can't be done," is not the man for the crisis. What is wanted now are men equal to the emergency,—men who can plan for the new year with a determination that it can and shall be done;—that it is possible to raise a larger amount of cane and produce a larger outcome of sugar, on

the same expenditure as the previous year. "How can it be done?" We answer:

First. By better preparation of the soil, by deeper plowing, by turning all the bad places into good land, and by improving every nook and corner, which have before been thought not worth looking after. Deep plowing is the best and most effectual way to increase the crop, for two inches of fresh subsoil are worth cart-loads of manure; and every re-planting of a field should be preceded by deeper and more thorough plowing than the last. Regarding the value of deep and thorough plowing the reader will find some plain talk on page 362. The advice there given should be followed on every plantation, and if faithfully carried out will result in larger and better cane and increased crops.

Second. Study the wants of the soil, and if manures or fertilizers are needed, as they are on most lands, find which is best to meet the deficiency, and watch the effects for future plantings. One kind of fertilizer may result in a larger outcome of sugar, another perhaps in less. Keep a record of the results for future guidance.

Third. Plant only the best seed cane,—seed that is fresh and vigorous, that has not been allowed to lie too long in the hot sun waiting for a wet spell, but seed fresh cut, which should be planted immediately. Not every planter is prepared to use seed grown expressly for this purpose, as Mr. Moore is now doing, but whatever seed is used, let it be the best to be had. It will pay to look after this seed business and to watch closely that not a stick of poor seed goes into the ground, and not only this, but that it is properly distributed, covered and cultivated.

Fourth. Watch the cane stripping. Harm is done in many a fine cane field by the laborers stripping too high and laying open the green stalk, which should never be touched till the leaf is ripe and half brown. Better not to strip your cane than to tear the green leaves off and check the growth of the plant, as is too often done. Too severe stripping will reduce the outcome of sugar more than many think it possible.

Fifth. Watch the sugar house. There are many leaks in this department, which have reduced the dividends more than

the owners ever dreamed of. Think of only 620 pounds to the clarifier where over 1100 pounds per clarifier are now obtained in the same boiling house, with no better cane than was ground in the former case. This is a fact, and can be vouched for. Better sugar boilers, greater care and less syrup turned into the gutter caused the difference in the outcome.

By close observation in these and other details, an increase of sugar may be relied on from the same area of ground planted. It may be only a small increase, but whatever it is, it will help the balance on the credit side of the ledger at the close of the season, and to place the manager and his assistants in a more favorable position with their owners.

In this connection, the following extracts from the *Jamaica Planter's Journal* will be read with profit :

"We cannot forecast the future. We know not what may be in store for us: but we do know that the things of the present furnish the soil out of which will grow the things of the future; and, day by day, we are gaining that knowledge, by means of which we may, if we will, influence the present, and also the future which flows from it. Toil and trouble surround us; sorrow and disappointment are our lot; difficulty, hydra-headed, follows upon difficulty. We escape impending ruin, and hardly have time to recover breath before we are called upon to face some new and unexpected enemy.

"The low price of sugar and the American exactions are bad enough, no need to multiply the difficulty, and to add the terrible borer. Men talk of the crisis as of a calamity that is past; it is with us to-day, changed in shape, and multiple in form. But there is no reason why we should lose heart. We ought rather to gain strength from the contest; for constant battling with difficulty, while it enervates the weak, strengthens the strong.

In the days when Rome was battling for very existence, those were counted true Romans and good citizens who did not despair of the Republic, but then they left nothing to chance, but, like wise men, used and applied all means for defeating their enemy, and saving their country. It is true we Barbadians have not yet despaired of our country, but the

fact is, we have hardly yet realised the true position of affairs; we cry out loudly enough about the hard times, and do nothing to make them better.

“These, and many other things, claim the planter’s attention. Knowledge is increasing daily, and he must use it, or be vanquished by those who do. Our own destiny is so far in our hands that we can choose between *ignorance* and *knowledge*; and we shall be the dullest of the dull if in these days of fierce competition we allow the forward foot to slip back even the fractional part of an inch. The starting point, of even such prosperity as we still possess, is “manure,” and nothing but manure; its fitness and solubility, human skill can furnish, while Providence provides the rain-water; for kind Heaven helps those who help themselves. We must increase and utilise our knowledge—the true lode star by which, alone, we can shape our course correctly—the only guide capable of bringing us safely through the difficulties of our time. We must neglect *no means* by which that knowledge may be applied. We shall be indeed more than lunatics if we allow an advantage that has been gained with difficulty to be lost.

“We are bound to maintain our export trade even were our difficulties ten-fold: we must maintain it, or collapse under the heavy pressure that is brought to bear upon us; and how can we maintain it without a regular supply of properly analysed plant food or fertilizers? Adulteration is one of the inconveniences of science, and, in order to counteract its evil tendencies, a vigilance committee must always be on the watch; let them but relax their efforts for a single year, and our market will again be inundated with rubbish, from which we need not expect any special return, and which will, therefore, be doubly costly. It will be wiser in us to consider this matter carefully, both as it regards our interest and our duty. We cannot blind ourselves to the fact that without correct fertilizers our sugar industry would speedily collapse, and that we are dependent altogether on their due supply, not only for the maintenance, but for the continuance of our sugar industry. We cannot shut our eyes to the difficulties of our position, nor can we afford to give up a single advantage that we possess.”

CORRESPONDENCE AND SELECTIONS.

*POLARIZING—WHERE, AND BY WHOM IT SHOULD
BE DONE.*

[BARBADOS AGRICULTURAL GAZETTE.]

The Polaroscope does not seem to be a favorite with our planters; its results are, from their point of view, so uncertain and so unreliable, that, notwithstanding the fact that the whole business has passed into the hands of the Island Professor of Chemistry, and is conducted at the Government Laboratory, there is widespread dissatisfaction with the existing arrangements for the polarization of sugar. The prevailing idea is that some central place, or places, in the town ought to be selected for the prosecution of this business; some central place whither the planter might at will resort, see and learn all about his tests; have his doubts removed; and his quibbles satisfied. The planter justly claims that he is the person primarily interested in the sale of sugar, and that he has a positive right to some share in a business, the results of which are equivalent to a valuation or appraisal of his whole crop. As it is, the matter has been taken almost entirely out of his hands—lifted actually out of his reach—with the result that he has no confidence in it.

It may be said that the planter, if it pleases him, can call at the Government Laboratory and obtain the desired information; but this would involve a drive almost out of Bridgetown,—away from his business haunts, a matter of importance to a man who visits town once a week full of business. And besides, a visit to the Government Laboratory is attended with a certain amount of ceremonial; planters cannot run in and out with the same freedom and ease to which they are accustomed in their ordinary business transactions with more public offices; the surroundings, associations, and distance from business centres of the Government Laboratory do not permit this.

Where the treasure is there will the heart be also, and it is no wonder that our planters grumble and are dissatisfied; their treasure is taken out of their hands, valued and labelled and handed back to them; they are like accused men who

wait, all-trembling, for the sentence which may be favorable or unfavorable, but over which they have no control; their fate, their property, their comfort, their whole prosperity depend upon the due performance of this service, and yet they have no voice in it; they truly urge that they are not, even in part, masters of a situation on which their all depends.

No wonder then that planters have taken to grumbling; they ought, we think, to grumble louder and to more purpose; some more independent than their brethren have leaped over the local barriers and sought, we believe with fair success, new markets. If the Polariscope and the American Treaty create a spirit of enterprise amongst us, and prompt us to build up new trade relations they will not have been altogether unproductive of good, and may turn out to be blessings in disguise. We hope so. In the meantime we cannot shut our ears to the tales of dissatisfaction which are only too prevalent in connection with Polarization. A sample of sugar, carefully taken, after being duplicated, or triplicated, has, it is said, been differently reported on by different experts, *and even by the same expert*. Again, four hogsheads have been so filled from the coolers that their contents were thoroughly and unmistakeably mixed; there could have been practically no difference in the relative value of sugar filled, all together, in this way, and yet in this instance the polariscope was said to show a material difference. No wonder then that planters are annoyed and perplexed, and ready to swear that the Polariscope is a fraud; they assert, and with some foundation for the assertion, that experts differ from each other, *and sometimes even from themselves*. Polariscope do not always appear to agree they say; and so they grumble righteously because their produce is taken out of their hands, and appraised (for it practically amounts to that) while they, moping in the dark, must sit helplessly by. This sort of thing cannot last, for whether the business may be rightly or wrongly conducted, men cannot be expected to give up absolutely the control and superintendence of their individual interests.

It is undoubtedly the planter's fault that things have got into this groove; at first he folded his hands and refused to have anything to do with the business; he would not even

discuss the subject, but left the matter to drift. The merchant, more business-like, settled it for him, and now the planter, who at an early time was afraid of the subject, sees plainly enough that testing sugar is a necessity, and quite the correct thing, in so far as it preserves an even balance; nor is Polarization ever likely to be given up; must at least continue while we remain commercially yoked to the United States.

We are bound to accept the situation, but have every right to claim our full share in a business which so crucially affects our interests. Let the matter be properly adjusted and all grumbling will cease. But we positively cannot accept the present arrangements. Our interests demand, and common sense suggests, that *sworn* and *responsible* officers should be carefully selected by the Government, and placed under the supervision of the Island Professor of Chemistry; and that these sworn Polariscopists should conduct their business at convenient centres in the business part of the city.

There is another point worthy of our consideration. The extra work thrown upon the Government Laboratory by this large polariscopic business, (whose extent may be gauged when we remember that it involves an expenditure in ten pence fees of at least, £600—£700 stg. in about six months), must of necessity overtax the resources of that department, and render it unequal to the due performance of its proper functions of teaching, experimentalising, analysing, etc., etc.,—matters of great public importance, for which we thought that ample provision had scarcely been made even when the Government appointed an assistant to the Island Professor of Chemistry.

Under the new regime, such as we have hinted at, the Professor would only be charged with the inspection and supervision of a department, which, we repeat, should be easily accessible to all concerned. The Professor, thus released from routine work of a somewhat simple nature, would be free to attend to those more important duties on account of which the Professorial chair exists, and would be, at the same time, at liberty to effectually superintend the new department on whose efficiency the value of our produce depends; so much so, indeed, that efficiency and correctness, alone, should be

the *sine qua non* of employment; there should be *no learning*, no pupilage—at the expense of the already too handicapped planter.

It may be said that our sworn gaugers and weighers do not give unmixed satisfaction to the public; the reason is that they are not subjected to inspection of any kind, which is a great mistake. There is no reason why this error should be repeated. We have nothing that we can afford to lose; every thing has been brought to a fine point, and the least remissness in this direction might deprive us of our profits altogether. The planter is, we are sure, wide awake to his own interests, and will insist that things are better regulated before the crop of 1893 is ready for the Polariscope.

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DISEASED BANANA PLANTS.

[AGRICULTURAL GAZETTE OF NEW SOUTH WALES.]

The Secretary of the Agricultural and Industrial Association of Fiji communicated with the Department of Agriculture at N. S. Wales, under date June 16th last, notifying the despatch of a case of diseased banana plants, and asking the Department to interest itself in having the disease thoroughly investigated. From this letter it appears that the disease has defied eradication by the banana planters of Fiji. The evidence seems to show that it affects the young plants, that after they are set and begin to grow the outer leaves begin to turn brown, droop and die, and that the succeeding leaves do the same as they reach from four to six inches in length. The plant continues growing in this way for several years without much increase in size, instead of growing as it should to a height of from six to twelve feet, and producing fruit. The disease is said to be very serious, although sufficient information has not yet been furnished to indicate the exact extent of loss.

In connection with this matter it may be mentioned that the Department also received from Clarence River some six months ago a specimen of diseased banana, but as this specimen consisted of a grown plant after it had been cut down, it was not possible to make out very much. It is possible however, that this disease from Fiji is the same as sent from

Clarence, and inasmuch as investigation has shown a number of causes for the diseased condition of the Fiji plants, reason exists for making them known, as that information may be of assistance to the banana growers in the northern part of this Colony.

The Fiji plants were found to be in some parts covered with aphides or plant lice, and these on some of the plants were so numerous that they might have done considerable damage. Still, it could not be proved from examination that they had done much damage, although they had existed in very large numbers—as many as several hundred cast-off skins being often seen in the axil of one leaf.

The Government entomologist, who has made an examination of these aphides, believes them to be a new species; drawings of them have been made by the departmental artist, and they will probably be described in a coming number of the *Agricultural Gazette*. In the root-stock of the Fiji plants a fungus was found. What the exact nature of the fungus is has not yet been ascertained, because no spores could be found. The exact systematic position of the fungus therefore remains unknown. But the fact that it does a good deal of damage has been established. Its presence may be known by a brown discoloration of the interior of the root-stock and roots. The tissues instead of being white, as they are when healthy, take on, when the fungus is thickest, a dark-brown tint, and where it is just penetrating and has not yet caused a serious destruction of tissues, a light-brown colour.

It is rather remarkable that in the soil about the roots of these plants nearly thirty species of nematodes should be found, about twenty-five of which are new species. Two of these species have shown to be injurious to the plants, one of them attacking the roots, and being found living parasitically on certain brown rotten cavities, and the other being found between the sheaths of the leaves of the plant, and in some cases even at the very core where the tissues appeared to be quite sound and white. It will therefore be seen that there are four separate causes for the diseased condition of these plants, viz.: aphides or plant lice, a fungus causing rot in the root-stock, and two different species of nematodes.

The remedies that are suggested in the present state of our knowledge, which of course is incomplete, are these :

1. That where the bananas are cultivated a system of rotation should be adopted; that no attempt should be made to grow banana plants on the same ground continuously for a long series of years, and this for two reasons: In the first place the soil naturally becomes exhausted of the elements necessary for the growth of the banana plants and therefore after a series of years the plants become weakly and do not thrive as at first. Furthermore, and this is quite as important as the first reason, if the banana plant or any other plant for that matter is grown continuously on the same land for a long series of years, the diseases of the plant are bound to accumulate on that piece of land. The disease which first appears in a mild form and only here and there, will in each succeeding year, attack more and more plants and usually in a more virulent manner. Unless special precautions are taken to prevent disease, a continuous and successful growth of any one plant on the same land is next to an impossibility. At the same time the Department thoroughly realises the difficulty of getting agriculturists in a new country to adopt a system of rotation. What farmers usually do is to find out the crop that will pay them best, to learn the methods of cultivating it and to obtain the necessary machinery for the crop, and then of course to keep on in that simple line as long as possible. No one can blame them for doing this, but a time always comes when this keeping to one crop can no longer be done, and the tendency is always to wait too long before beginning a system of rotation.

2. Judging from the specimens sent, the soil about banana plants is infested to an extraordinary degree with nematodes, therefore it is best in cultivating, to plough deeply or to occasionally subsoil the land. These nematodes attack the roots of plants and exist largely within eight inches of the surface. As they become rarer as the depth of the soil increases, it follows that if the land be ploughed deep and thoroughly so as to turn the soil exactly bottom side up, a soil comparatively free from nematodes will be brought to the surface and at the same time the nematodes which were near the surface are buried so deep that they can do much less damage than they could if at the surface.

3. From what has been thus far seen, the main difficulty

with these plants is thought to be due to the attacks of the fungus mentioned above, and here the best remedy to recommend is great care in setting the new suckers, i. e., in making new plantations. As pointed out, the presence of fungus is indicated by discoloration in the root stock. Now when suckers are cut off from the old plant with a spade they should be inspected and all brown and rotten portions should be carefully removed, and all suckers from which this brown and discolored portion cannot be removed without destroying the chances of growing should be discarded. Of course if the sucker is set out with some of this diseased tissue attached to it, when it grows the diseased tissue keeps pace with the growth and it will not be long before the plant is seriously hindered and perhaps altogether destroyed by this rot at the root.

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CONCERNING MANURES.

[FROM THE MACKAY SUGAR JOURNAL.]

The day when the planter and manufacturer calmly talked about working out his land and then removing his mill to new soil has passed away. Were land and locality obtainable the expense of such a proceeding, the dead capital buried in unproductive acres would soon bring to ruin the man foolhardy enough to attempt such a thing. In like manner the grower is learning the lesson that if he continues to take from the soil the elements of plant life without returning those constituents in the shape of manures he will soon cease to cultivate cane, or anything else, with profit to himself. In this respect we are, however, at the cross-roads, one leading to affluence, the other to poverty. The virginity of his soil is only just now passing away, and the cultivator finds it hard to convince himself that he can no longer leave nature to do the work while he sits down and watches her exhausting herself on his behalf. But this conviction, unpleasant as it is, is steadily forcing itself upon him, and he turns uneasily round to grasp some information on a subject at present practically a sealed page to him. Seeing his difficulty, yet desire to do

aright, we place before him such information as is, from time to time, available.

The cultivator has in the first place to commit a motto to memory—one given by the leading agriculturist of England—"get good land and manure it." Nothing but loss and dissatisfaction can result from endeavoring to make lean, hungry land yield crops. Let the land have a good body and you can then put a soul into it. Nowhere in the world has agriculture been successfully prosecuted for many years and no manure used. Surely the Queensland cultivator does not think that he can succeed where all others have failed. In due course we shall be enabled to give the actual results of manuring in this colony, but anything that these may disclose will but serve to strengthen the grower in his determination to farm his land scientifically. Many planters at present complain of the expense of manuring, of the difficulty of ascertaining the manures to be used and the actual value of the same. To those who have studied the question the whole subject is practically reduced to an exact science. Given a manure with certain constituents in specified proportions and its cash value is so much. The quantity required per acre is easily ascertainable, when the constituents of the soil and of the plant to be grown are considered, and the increased production per acre over a number of years has now passed beyond the region of conjecture. Unfortunately the analysis of soils is not as yet one of the aids held out by our local Department of Agriculture, but we hope soon to hear that the engagement of a chemist has been recognized as desirable and practicable. The difficulty is a serious one and strenuous efforts should be made to obviate it. The average farmer is prone to prefer a bare living to the possibility of making even a small loss, and he cannot be considered unreasonable when he asks that the Department, ostensibly established in his interests, should make some show of affording him information on points of vital importance to him.

Important as the analysis of soils is the analysis of manures is still more so. Many fertilisers are offered for sale at high figures when their actual manurial value is not proportionate to the price asked and the farmer may fairly claim it as a right that the contents of compounds should be made public,

and, further than that, guaranteed. A man will suffer more by using highly adulterated manures than by buying milk adulterated with water, and yet the law protects him against the lesser fraud and leaves him helpless in the case of the greater. At present, therefore the farmer must content himself with the experiences of his neighbors or the results of personal experiment, and where a district is known to be generally suited to the growth of a certain crop he can hardly make a serious mistake in planting a similar crop himself. He can, however, get great assistance from a careful perusal of all information offering on the subject, and with that object we re-publish in this number a very interesting table of manures—their constituents, their manurial value, and their cost—offered for sale in Sydney. From it will be seen the values of manures as they are in reality and as they might be judged by the price asked by the vendors. The list, which has been published by the New South Wales Department of Agriculture, coupled with even a superficial knowledge of the requirements of his land and plants, will enable the grower to make a shrewd guess at what he should buy to replace the constituents taken from the soil, while if he prefers to go more slowly and surely he can by making inquiries and by experiment obviate all chances of unnecessary expenditure. We hope before long to find that scientific farming has become general throughout this colony, and any notes on this subject tendered us by our correspondents will be placed at the disposal of our readers for their help and guidance.

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*THE CANE BORER. (DIATRÆA SACCHARALIS,
FABR.)*

[FROM THE SUGAR CANE.]

We have received Bulletin No. 30 of the Botanical Department, which contains a very full and thorough history and description of the above pest, giving also an account of its habits and geographical distribution. We should have liked to reproduce this nearly *in extenso*, but unfortunately have not space.

That the ravages of this borer are by no means inconsiderable, will be seen from the following extracts, but we cannot

overlook the statement that under certain circumstances, viz., in good seasons and where improved cultivation is practiced, the insect is "not very formidable," which, taken in conjunction with the remarks of a Trinidad correspondent of the *Demerara Argosy*, seem to confirm our opinion, more than once expressed, that the remedy for this and all other pests and diseases of the cane is to be found in more rational and scientific cultivation, and the use of appropriate manures, possibly also rotation of cropping, so as to prevent exhaustion of the soil. Such is distinctly the experience which has been gained during many years of agricultural practice in this country. A quotation from Mr. Gosse's work, "A Naturalist's Sojourn in Jamaica," given in the Bulletin now before us, seems to indicate clearly that it is weakly crops which are attacked to any serious extent, and is as follows:—"It is generally observed that the borer commits the greatest injury to the cane after a rapid growth, followed by a spell of dry weather, when vegetation seems not only suspended, but the plant itself struggling for life." The whole experience of the last fifty years goes to show that the eradication of disease in man and animals is to be looked for in good food, sanitary precautions, and occasional changes of locality, and something of this kind is certainly to be kept in view in dealing with the vegetable kingdom. The weakly animal is the most subject to disease, the weakly cane plant will certainly be the one attacked by insect pests. We consider that the *sereh* disease, which has done such damage in Java, is mainly a consequence of exhaustive cultivation.

As regards the loss occasioned by the borer, Mr. D. A. van Putten writes (March, 1892,) to the gentleman who has drawn up the present Bulletin:—

"I now send you two pieces of cane, and a small phial with one of the worms in rum. The whole cane becomes rapidly dry, and the leaves perfectly dry, so that the stock will not feed on them, and the short top is useless for planting. The crop will fall off very much; we had calculated on 140 tons, but shall not make more than 115 tons of sugar. Our neighbors are also affected by it."

The following quotation from a letter of Mr. G. W. Smith to the *Barbados Agricultural Reporter*, seems to supply the

latest contribution to the study of the question, and we have not alluded to it in previous issues we give it in full, calling special attention to the clause which we have put in italics:—“Mr. G. W. Smith (24.) in his excellent article, writes:—“As a remedy I would suggest the advisability of cutting the ripe canes as quickly as possible. Take up every piece of rotten cane, carry them out of the field and pass them through the mill; this will destroy any grubs that may chance to be in them. Burn all the megass, for a couple of seasons at least, as the method of stacking megass for future use may assist in keeping up the disease; on no account leave pieces of rotten cane lying around the estate, these only form breeding ground for fresh hordes of insect-pests. The trash and stumps should then be collected, carted away from the field, and burnt. The reason of this is, that in some places it has been found that there are ants in the ground which prey on the borer and help to keep it in check. Burning on the field would thus destroy them also.

“Plants should then be selected from the strongest unaffected canes procurable, and not at random, as is often the case; these may be immersed in water at a temperature of 140 degrees for 48 hours, to which may be added, as an additional precaution, a one per cent. solution of Carbollic Acid or Sulphate of Ammonia. The kerosene emulsion may also be useful. It is just possible that at some stage or other these insects may exist in the soil, and it is clear that if we could reach them with a fertilizer, which is at the same time an insecticide, we may do a good deal towards eradicating them. In Queensland there is a German fertilizer used in canefields infected with an insect pest that emerges from the ground and cuts off the stalks of the plants. This fertilizer is called “Kainit,” and farmers there who have used it, say they enjoy an immunity from the pest. The cost is about £3 per ton, and it is reckoned that about 300lbs. is enough for an acre. This may be ploughed in as a fertilizer, and at any rate seems worth a trial.

“In conclusion, I may remark that one feature of the disease deserves careful attention. It is this. In no case have I observed plants of the Transparent, Ribbon, or Caledonia Queen canes affected by the insect, either moth or beetle, and that, too, even when growing side by side with badly diseased

Bourbon canes. This would seem to point to the fact *that the Bourbon variety is either a weak one, or has become degenerate from long cultivation in the West Indies, in the same localities. .*"

This question as to the deterioration or degeneration of the Bourbon or Lahaina cane has begun to excite attention in the Hawaiian Islands; the question to be settled is really, if the deterioration exists, whether it is not owing to the exhaustion of soil, necessary constituents having been taken out during a series of years, without any sufficient replacement, which would indicate the need of scientifically applied manuring.

The following summary, which forms the conclusion of this interesting report, brings the question of insect pests, which was rather exhaustively noticed in this periodical about three years ago, fully up to date, and we are glad to place it on record for future reference:—

SPECIES ALLIED TO THE SUGAR-CANE BORER.

"The genus *Diatræa* seems to be more especially neotropical although a species (*D. striatalis*, Snell.), very similar to ours, but supposed to be distinct, occurs in the Malay Archipelago. There are also two species, in addition to *D. saccharalis*, recognized in the United States, and named by Prof. Fernald *D. alleni* and *D. differentialis*. According to Prof. Fernald, as quoted by Comstock (10.) Zellar described several South American species under *Diatræa* about the year 1890, but I have not seen the paper in question, and do not find any mention of the species in the 'Zoological Record.' In 1882, Zellar described *Diatræa pinosa* from Columbia. *Chilo*, the closely allied genus to which our insect has frequently been referred, is of a very wide distribution, and occurs in both hemispheres. In the United States four species (*C. plejadellus*, Zinck., *C. densellus*, Zell., *C. spumulellus*, Zell., and *C. comptulatalis*, Hulst,) are known, and in 1878, Zellar described several from South America.

"*Diatræa* belongs to the family *Crambidae*, which consists of moths, usually of plain colors and small size, remarkable for their long palpi, which would give them the appearance of having an elongated snout. Several of the species are known to be destructive to plants of the grass family. Two

species of the typical genus *Crambus*, are known to occur in Jamaica, namely *C. curtellus*, Walker, and *C. ligonellus*, Zellar.

"It is not proposed to here enumerate the numerous other insects which have been reported to attack the sugar-cane, but as there has been some confusion between the lepidopterous and coleopterous borers, and between the true borers and insects, a few remarks seem necessary.

"There is a little beetle of the genus *Xyleborus*, brown in color, cylindrical in shape, and less than an eighth of an inch long, which has caused great alarm Barbados recently, and has been the subject of various telegrams and newspaper notices.

"Mr. G. W. Smith writes on the subject:—

"The 'Destructive Borer' and the ravages done by that insect to the crop of 1892, is engrossing the attention of every one connected with sugar-planting in these islands. . . . I have read with interest the several letters from the pen Miss Ormerod published in the *Herald* newspaper, and have been favored with a copy of Prof. D'Albuquerque's Report. . . .

"Three years ago the planters at St. Vincent observed that an insect pest was devastating their canefields and so severe, were its attacks, that it was estimated that one-third of the crop was destroyed by them. I had an opportunity of examining numerous samples of diseased canes, and I also spent several days in the field, studying the habits of the insect. At first sight, judging from the numbers of the small beetles (*Xyleborus perforans*) found in diseased canes, I was led to think that they were real depredators. On close examination, however, it became clear to me, and numerous subsequent investigations have justified the conclusion; namely, that the beetle is not a destroyer of the cane, but only a successor to a far more formidable pest—the lava of a well-known pest, *Diatraea saccharalis*, and that the beetle very rarely, if ever, attacks a cane that has not previously been ravished by the moth-borer. This may easily be seen by close inspection, and to note how far this theory held good, I have repeatedly taken specimens at random from an affected field, and have always found that in the majority of withered and diseased-looking canes, there were the large tracks of the moth-borer, without a trace of the beetle; in a great many instances, there were the tracks of both moth-borer and beetle in the same

cane, but never an instance of the beetle alone. Mr. Grant, the manager of Woodland's estate in this island, has been with me at several of these investigations, and after examining numbers of specimens, we are pretty well convinced, so far as it affects Granada—that not only does the moth-borer first attack the cane, but that the beetle never commences its work until the cane has become thoroughly soured.

“There is no reason to doubt that Mr. Smith's opinion, that the *Xyleborus* is not responsible for the damage, is a perfectly correct one, and the only amendment needed to his account is that it may, as well appear below, follow the attacks of the weevil as well as the moth.

“The genus *Xyleborus* includes some species, as *X. dispar* in Europe and North America, and *X. cœlatus* in North America, which are injurious to trees; but there are also numerous species which appear to exist only in rotten vegetable matter, or under dead bark. Thus for example, in ‘Insect Life,’ 1890, p. 167, we read of *X. pubescens*, which lives in orange and other trees:—

“The mature beetles burrow in trees of all sorts, but have never been known to infest healthy living orange trees, but when found in the orange always occur in the dead or diseased wood. It cannot, therefore, be considered injurious to the orange. The freeze of last winter, which you say killed many of the orange trees, accounts for the presence of numbers of this insect

“Numerous species of *Xyleborus* are known from the West Indies. Eichhoff, in 1867-68, described *X. capucinus* from Guadaloupe, *X. affinis*, from Cuba *X. alteurnans*, from St. Domingo, *X. inermis*, from Cuba, *X. torquatus*, from Cuba and Port Rico, and *X. amplicollis*, from Port Rico.

“Through the kindness of Dr. Plaxton, I have received three pieces of injured cane from Barbados, together with numerous specimens of the *Xyleborus* in a bottle. The specimens of cane are fairly stout, juicy and well-formed, and do not present the dried-up appearance of those attacked by the *Diatraea*. Within, however, they are sour and rotten, and in many places, especially about the joints, the little burrows of the *Xyleborus*, hardly $\frac{1}{8}$ th inch in diameter, are to be seen. But in addition to these large burrows, some half-an-inch

wide, filled with cane splinters, and terminating externally in holes of considerable size. In one of these burrows I was fortunate as to find a pupa, from which the adult beetle had been nearly ready to emerge. Although not in good condition for examination, this is doubtless the well-known Borer-Weevil, *Sphenophorus sacchari* (Guilting), which has been known in the West Indies as injuring sugar-cane since the latter part of the last century. It is extremely similar to, and perhaps indetical with *Sphenoporus sericeus* (Fabr.), which is common in Jamaica, and has been observed by Mr. Bowery breeding in plantain banana. A good account of *S. sacchari*, as occurring in Jamaica, was written by Mr. Samuel Kell King in 1845, and is quoted by Gosse in his 'Naturalist's Sojourn in Jamaica,' p. 451.

"In the Sandwich Islands the sugar-cane is attacked in a similar way by allied species, *S. obscurus* (Bdv.), of which a good account, with figures, is given in 'Insect Life,' 1888, pp. 185-189. This insect is also found in Tahiti and New Ireland, and is supposed to have been introduced into the Sandwich Islands. It feeds on the banana as well as the sugar-cane.

"Mr. King in 1845 suggested that the Jamaican insect was not indigenous, 'but that it was imported into Jamaica from Tahiti; for it suddenly appeared in 1797, the year after the Tahitian varieties of the cane were introduced into the Island.' In the face of this suggestion, and the fact of the Pacific Island species breeding both in sugar-cane and banana, one might readily suppose that the West Indian *S. sacchari* and *sericeus*, and the Pacific *obscurus* were all one and the same species, which originated in Tahiti, and should, according to priority, be known by the name *sericeus*. This, however, is rendered quite doubtful because the figure given of the Sandwich Island beetle in 'Insect Life.' and Mr. Schwarz's elaborate description, do not agree with Jamaican specimens of *sericeus*. Yet *sericeus*, as shown by the short series in the Museum of the Jamaica Institute, is quite variable, and as the specimen described by Schwarz was probably immature, it is possible that the apparent differences may prove not to have specific importance.

"Thus it appears that the sugar-cane pest now causing injury in Barbados is not the *Xyleborus*, and not even the

Diatraea, but the *Sphenophorus*, or weevil. This is, of course, so far as one can tell from the specimens received; but it is likely enough that the Borer-moth also occurs in Barbados, and is responsible for a part of the damage. It is clear, however, that the *Xyleborus* follows the depredations of the weevil, as well as those of the moth.

"In Jamaica, on the other hand, we are suffering from the Borer-moth, a decidedly more serious pest than the weevil, which will require continuous attention if it is to be controlled."

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TWO NEW YANKEE INVENTIONS.

RAMIE AND LACTITIS.

In the scientific chronicle of the *American Quarterly Catholic Review* is an account of two remarkable inventions, of which we shall hear something more in this country before long. One is the use of ramie fibre as a material for the manufacture of steam pipes. The pipe is made out of ramie fibre, and then subjected to tremendous hydraulic pressure. Under this operation it becomes two and a half times as strong as steel, while remaining comparatively light. It will neither swell nor shrink, nor rot, nor rust; and for work buried under ground this is another most valuable property sadly lacking in iron and steel. Ramie is a non-conductor of heat. Moreover, ramie, in this hardened condition, is sufficiently incombustible to make it safe for use in steampipes.

Still more remarkable is the other discovery which is announced in the same chronicle, which is to the effect that artificial ivory is to be made, in the future, out of milk :

The milk is first coagulated as in the process of making cheese. This is then strained and the whey rejected. Ten pounds of the curd is taken and mixed with a solution of three pounds of borax in three quarts of water. This mixture is now placed in a suitable vessel over a slow fire, and left there till it separates into two parts, the one as thin as water, the other rather thicker, somewhat resembling melted gelatine. The watery part is next drawn off and to the residue is added a solution of one pound of a mineral salt in three points of water. Almost any mineral salt will answer; for example

sugar of lead, copperas, blue or white vitriol. This brings about another separation of the mass into a liquid and a mushy solid. The liquid is again got rid of by straining, or better, by filtering. At this point, if desired, coloring matter may be added; if not the final product will be white. The solid is now subjected to heavy pressure in moulds of any desired shape, and afterwards dried under very great heat. The resulting product, which has been named "lactitis," is very hard and strong. It may be used in the manufacture of a great variety of articles, such as combs, billard balls, knife handles, penholders—in fine, for almost anything for which bone, ivory, ebonite or celluloid have heretofore been employed.—*Review of Reviews.*

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TRASHING CANES.

[BARBADOS AGRICULTURAL GAZETTE.]

A controversy has of late been going on with reference to the value of this time-honored habit. We think the day has come when planters should no longer be guided by precedent in the conduct of practical agriculture, but that everything should be tested, weighed in the balance *carefully*, and accepted or rejected on its own merits. Creatures of habit, we are only too prone to follow "Thumb-rule." Our fathers did it, and so do we. We know not why: but the knowing why is the important part; and we can never know the real "why," until we learn to criticise our own work, and so endeavor to perfect it.

There are many very substantial reasons for and against "trashing," which would lead us to the conclusion that it is not a practice to be indiscriminately followed, but rather to be used to suit the requirements of any given case. Certain it is that *turning under* frequently gives better results, while the disturbance due to trashing invariably checks the growth of the young plants, takes the green out of them, and tinges them with sickly yellow at an age when growth and development are of prime importance. A month's growth lost can hardly be regained, even under the most favorable circumstances, by a plant whose whole space of life is some fourteen months.

However, we do not wish to discuss but rather to provoke

discussion, and will content ourselves with observing that some of the best young canes we see this season have not been trashed; at Rowans, St. George, in a field next the public road, twelve rows have been inadvertently left untrashed; the contrast, between these twelve rows and their fellows, is very marked indeed, their greeny bunchiness, and vigorous shoots amply proving that they at least have benefited by being left alone.

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MAKING THE SUBSOIL HELP THE SOIL.

[CORRESPONDENCE N. Y. INDEPENDENT.]

It is generally admitted that by increasing the depth of cultivated soil the product is augmented. It is also understood that while culture increases the effectiveness of manures, judgment must be shown in the use of both. If the fertilizer forces growth too much in one direction and too little in another loss will ensue. If too much new soil is brought up at one time and less than is necessary for renewing purposes at another, the same result will follow.

The skillful market gardener depends largely for success on the twofold practice of fertilizing and pulverizing. To each acre of his land he annually applies seventy-five tons of well-rotted manure. While with the one hand he thus nourishes his plants, with the other he aids them to extract from the soil the treasures he wants.

Though the importance of soil culture is conceded by all enterprising farmers, the practical advantage of subsoiling is not receiving the attention it merits. So long as fairly good crops can be grown under hasty and cheap surface plowing, it is not to be expected that farming systems will change much. But as we approach a time when our exportation of grain must either terminate or production from a given acreage be largely increased, the benefits resulting from deep culture will be recognized.

For every inch added to the depth of loosened soil two hundred tons per acre are prepared to take an active part in sustaining vegetation. It is true that the roots of most of our field crops will penetrate for some distance a dense unbroken subsoil, but the effort they have to put forth for that

end will impair their growth and product. One of the main objects of forceful farming is to secure for a crop at the least possible expense rapid and continuous growth. The forcing process begins by potent fertilizers adapted to special needs being placed within the reach of the tender plants, and with resulting root invigoration their ramifying powers are so increased that under favorable soil-conditions an enhanced yield is assured. In that respect there is harmony of operation in the animal and vegetable kingdoms. The breeder of choice beef-cattle relies on constant rapid growth from calfhood to maturity for the highest attainable market success. If after one month of liberal feeding his stock were put on straw alone for an equal period, the stunting effect would be disastrous to the profit account. Something of the same kind happens under shallow plowing. For a time the crop will promise well; but when dry weather comes and the roots have in their descent reached an impacted floor where for long periods the treading of horses and scraping of plow-shares have been doing hurtful work, its growth will be hindered in a way to impair the product.

If this dense understratum is broken up and left in place it will undergo chemical and mechanical changes which in the following year will tell upon the returns. It is on shallow soils with clayey under-beds that the compacting processes of ages have done the greatest injury; but even there surprising changes will be wrought when the subsoil plow has been wisely used.

There are good reasons for expecting better harvests from deeply pulverized land than from that which has only had a shallow, hasty plowing. By a free admission of air, ingredients which had previously been worthless, become soluble, and take part in crop production when drought comes moisture condensed in the interstices of such a soil will keep plants in healthy growth, while those on solid, dry ground will wither. The rainfall, in percolating through loose earth, enriches it, whereas on a hard, impenetrable surface its good effects are slight. To the farmer who is satisfied with a wheat product of twelve bushels per acre, the foregoing remarks will seem visionary and inconsistent with economical farming. But if he could double his crop with a very slight in-

crease of his harvesting expenses, would not the extra yield pay for a large amount of soil preparation? There has been no case as yet in agricultural practice where it could be said that the utmost possible limit of soil production had been reached, or even guessed at. Land, generally, is wonderfully responsive to liberal treatment.

There must be economy, of course, but sometimes seeming extravagance gives handsome returns. It costs money to secure strong, active horses for farm work, but small, broken-down animals are not to be compared to them on economical grounds even if they cost but little. It pays to have effective appliances to work with, no matter what the business may be. And this is just as true in farming as in any other occupation.

That the subsoil can be drawn upon by the growing of deep-rooted plants, to increase the fertility of the soil, is a fact deserving of wide recognition. The various kinds of clover are especially serviceable in that respect.

They seed on soil-enriching elements which are lying inert several feet beneath the surface, and bring them up for the farmer's benefit. When consumed on the farm these clovers will give a potency to home manure which will tell on coming crops.

Of all the clovers, pre-eminence must be assigned to alfalfa. In sinking its roots many feet into solid ground; in its going to water if that is practicable; in the power it has of extracting from waste and otherwise inaccessible material the very ingredients required to nourish our common crops; in its permanency for ages as a fertilizer and not an exhauster of the land it occupies; in its immense yield on rich, irrigated soils; in its feeding value; and generally in its being thoroughly fitted to make the subsoil enrich the soil, it is proving, and will continue to prove a marvelous blessing to the agricultural world.

While the greatest achievement of alfalfa must always be where water is abundant, it is a mistake to suppose that it cannot be grown to advantage on any soil of fair quality. It will grow wherever red clover does well.

In providing a desirable food for calves, pigs and chickens an acre or two near the homestead should be available on

every farm. There are places, too, where by the building of a cheap dam in some handy creek, irrigating water may be secured.

There is true wisdom in setting out and caring for a good sized wood-lot convenient to farm buildings. If it is rightly located, the shelter it gives will have a money value. A fair amount of timber makes land attractive, and thinnings and prunings will always be useful. Viewed solely as a means whereby the subsoil can be made effective in enriching the soil, a timber clump deserves attention.

If the leaves are collected and mixed with soil they become, in a few months, a choice manure for the vegetable and flower garden. The gnarled oak growing on a bare, rocky hillside and yielding leaves and acorns in abundance year after year, shows what a mysterious power it has been endowed with, to create something useful out of what, as to availability, was nothing. The farmer who is constantly watching for chances to add to his supply of manures, by collecting leaves, weeds or anything else that will soon, under his care, return to dust, has found a key with which to open nature's treasure house, and the appearance of his home will announce the fact to every intelligent observer.

DOS CABEZOS, ARIZONA TER.

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*THE AMERICAN SUGAR REFINING COMPANY AND
THE MCKINLEY ACT.*

[FROM THE SUGAR CANE.]

It might almost be said that at the present moment the absorbing topics in the sugar world are those which we have just named above. That this remark is not too strong will be seen from the extracts from various Continental and other journals which we shall proceed to quote and comment on. And it is not to be wondered at that attention should be very closely directed to these two things, viz., the effect of the McKinley Act and the action of the American refiners, when we consider that the sugar markets of the whole world have been more or less interfered with and thrown out of their usual course by these two great factors, for which, it is evident, none of us had made sufficient allowance. Had the

American refiners not been able to take concerted action and eventually unite into one great Trust, and so regulate their purchases as up to now to dispense almost entirely with their usual purchases of European sugar, and thus practically control the general market, and had that concerted action not been favored and rendered possible by the McKinley Act, we should have seen much higher prices than at present, and those great profits which are now flowing into the pockets of the American Sugar Trust would have been divided among our colonial planters and the European beet sugar producers. We are not now endorsing the exaggerated statements of some few American and other writers, who have mentioned fabulous sums as representing the profits at present being made by the American refiners, but we are confident that those profits must be large and will be still larger, for probably it is only policy that has prevented the Trust from running up prices, which they are only waiting to do when it will be quite safe. But it cannot be a matter of surprise that the growth of this huge monopoly should not only be regarded with dislike in European countries, but that even in the United States a feeling of distrust is growing up, and that measures should be taken there to test the legality of the combination known as the American Sugar Refining Company, or as the Sugar Trust, for we notice that American journals have in some cases adopted the latter term. In all fairness we must admit that our American friends are simply doing, on a magnificent scale and very successfully, what many others would only like to do if circumstances and public opinion and, we may add, "smartness" made it possible for them. So there need be no "stone-throwing" on this score. However, the question, as far as regards the McKinley Bill, has now been openly made a political one in America, the Democratic party having, in the language of one of the sugar journals, "come out fair and square for free trade, beginning with sugar." The prospects of success seem to us, to say the least, doubtful, as it is difficult to believe the country will at once annul a measure which can hardly be said to have been fully tried as yet.

The *Journal des Fabricants de Sucre* considers that so far as sugar is concerned, all must be at one in recognising the fact

that "the key of the situation is to be found in the United States, viz., in the Sugar Trust, for how could it be otherwise when the business they control is so enormous, involving the control of 1,800,000 tons of sugar, one-third of the known production of the world." The profits realised by the Association were in 1891 about £1,400,000, and a shareholder has ventured on the assertion that this will be more than doubled in 1892. "Such profits, realised by a small number of individuals, press very heavily on the various factors connected with the sugar trade. The action taken by the American Trust, which presses at one and the same time on the production of sugar at its very source and on the multiplicity of uses to which it is put, is in fact of a nature to excite everywhere a well-founded uneasiness. Even in the United States, the grocers and retailers are dissatisfied, and are asking if this bounty will be likely to last, and whether they will not, in a certain time, come to depend on one sole and omnipotent seller." The *Journal des Fabricants* thinks that Germany has not made a very good bargain with her reciprocity treaty, and says people there are beginning to question what may be the real value of such an arrangement, concluded with a country which possesses such an autocratic association. M. Dureau says that "there is, in fact, no true reciprocity with a State which permits the existence of a private association strong enough to utterly defeat the end which two Governments had in view, viz., that of a common benefit and an exchange advantageous to both parties. And if things have so turned out in the case in question, would not people have a right to talk of trickery, and say that all the advantage is on the side of the United States, and that it is evident the German sugar has to stand the loss on American wheat, maize, and bacon? The same observations, in a less degree, may be made with regard to France, and it will be in vain for M. Jules Roche to have included sugars in the projected treaty with the Government at Washington, if those sugars can only be sold at a loss in the United States market. There would be no reason to object if those prices were the result of the natural movement of supply and demand, but if it is not so, the condition of sale of French sugars to the United States will depend, in fact already depends, on the will or caprice of a single pur-

chaser, the American Sugar Refining Company, the all-powerful syndicate of American refiners."

M. Dureau thinks that "it will be necessary to oppose to the syndicate of American refiners a syndicate of European producers regulating the prices of their sugars, and so bringing the Americans to terms. Such an undertaking has nothing chimerical about it, and perhaps it would be more easy to realise than an international sugar convention."

The French journal further expresses the apprehension, which is probably well founded, that the Sugar Trust will, in no short time, proceed to threaten their South American market, and that something must be done to maintain and develop the French legislation, so as to support their export trade.

So much for the French view of the question. We have already reported the passing by various branch associations of sugar manufacturers in Germany of resolutions favoring the establishment of a definite agreement as to the amount of sugar to be produced. Since then this course has been approved at other meetings of similar branch associations, but the *modus operandi* seems hardly yet clear to any of them. *Kuhlow's* thinks it is quite impossible that the existing abstention of the American buyers can continue, and believes the American sugar ring will soon learn on what a false speculation it has embarked. We take leave to doubt this, it looks very much as though the wish were father to the thought; the American sugar ring is well managed, and for a time, at least, must be regarded as master of the situation. It is not a false speculation to be making a couple of millions (to take a low estimate) and to stand to lose nothing from a commercial point of view, the only real danger being political, as far as we can see.

The *Deutsche Zuckerindustrie* considers it lucky that the action taken in North America should have happened at a time when the stocks are comparatively small, so that the Trust cannot all at once become the sole unconditional dictator of the market; but the short time between now and the next campaign, with a possibly much larger production and much heavier accumulation of stocks, must be utilised to take steps to prevent America from spoiling the entire sugar

market of the world, and thus causing heavy loss to the producers. The German journal agrees with the French in regarding a mutual agreement as to the quantity to be sown and the regulation of sugar production by the beet-growing countries of Europe as the best solution. In face of the urgent necessity for some such united action, the great difficulties which beset the realization of such a scheme must surely vanish, and what had appeared to many only a theme for scientific discussion, seems in this light a matter which most immediately and urgently affects the vital interests of the industry thus threatened.

The last number of the *Deutsche Zuckerindustrie* which we have received contains the following:—

“It cannot be expected that the Government will really attack the Trust, even if the news (of legal proceedings being taken to annul the contracts of Claus Spreckels and others with the American Sugar Refining Company) be well founded as to the real intentions of the promoters. There remains, then, the extraordinary danger still before us, the fusion of a number of our largest buyers, and the depressing influence exercised on prices in the whole of the sugar markets, against which we still have to contend.

“Since the beginning of the present year, the time when the Sugar Refining Company set to work to absorb the other undertakings, the basis of the raw sugar market has been completely changed. The results are already showing themselves, but will probably not be felt in the most acute form until the next campaign. We should be ignoring all that has been taught and learned by experience, if we were to think that matters which have been so strongly diverted from their regular course, as has been done in the case of the position of the sugar market by the action of the Trust, will in the natural order of things again right themselves, and of their own accord again assume a satisfactory position, while those interested may quietly look on. It would be blindness and weakness to merely take up a waiting attitude. Every clear-sighted man must rather see that the blow which has proceeded from America makes a counterstroke from Germany necessary. We gather plainly that the specialist journals of other countries have on all sides declared as an absolute ne-

cessity, that union of raw sugar producers for action against the autocratic domination of the entire raw sugar market, which is in agreement with what we for some weeks consistently advocated. But men are waiting to see what Germany is going to do, for the interests of Germany as the principal producer of raw sugar for the universal market, seem to be threatened first of all.

“On the 30th and 31st May and the 1st June next, the German manufacturers will assemble here in Berlin for a lengthened deliberation, and the result of these should be to promote in many directions the further development of technical manufacture. There are undoubtedly questions and problems of the greatest importance to settle. But the whole of them seem to us to be surpassed in importance by the question: How can we retain our market; what can we do in order to secure to ourselves in future anything like remunerative prices? It is true the question is not down for discussion; but it is self-evident that on such an occasion those things which are most important will not be forgotten and at least some exchange of opinions will take place. But every one will very shortly recognise, from his own personal experience, the fact that this question is at this juncture the most important, and has the widest bearings of all, unless matters are very considerably changed.”

The remarks of the *Journal des Fabricants*—which we have quoted above—with regard to the failure of the reciprocity treaty, elicit the reply from the German journal that there is in fact no reciprocity treaty or rather “treaty of commerce” at present existing between the German Empire and the United States, and the *Journal des Fabricants* is in error if it thinks that Germany is compelled to submit permanently to conditions of supposed reciprocity where the advantages are all on one side. For our part we fail to see in any of the so-called reciprocity treaties made hitherto, any advantage to other parties than the United States, where any advantage at all exists, for some of the agreements concluded with States on the American continent really seem to have no immediate commercial object, but rather an eventual political bearing.

Turning now to the West Indies, we find that a feeling of dissatisfaction is becoming manifest with regard to the results

of the agreements made under the McKinley Act. It is only fair to remark that most of these colonies never expected any great results from the agreements into which, however, they felt compelled to enter in order to keep at least for a time their principal market. But they are beginning to regard with dismay the fact that the Trust is *de facto* the only buyer and perhaps also the only seller in the American market, and that, when the moment arrives, that powerful combination can deal with them absolutely as it likes. Planters in these colonies are again turning to the English market, as offering them the best chance. A good deal of stress has been laid in certain quarters on the fact that the action of the American Government, in practically lending a hand in the promotion of the refiners' monopoly, is in contravention of its duty to the country whose interests they have in charge. It cannot be doubted that such action, where the interest and the profit of the few are considered, and the vast mass of consumers are taxed to supply this profit, is economically unsound, and that the gain by the employ of extra American labor, large as the sum may be when considered alone, shrinks into nothing in comparison with the huge loss to the nation at large resulting from the higher prices paid. But we have really no *locus standi* in complaining of this action; we, in the past, and every other nation in the present, have legislated and do legislate in the interest of the capitalists and of small classes, to the damage of the community at large; but the sooner the American nation awakes to the facts, the better for its real prosperity, and in the interests of our own colonial producers we heartily wish the day may not be far distant.

The usually well-informed and very ably conducted *Merchants' Review*, of New York, lately stated:

"It looks to us as if the protective tariff on refined sugars were doomed, although it may take a couple of years to effect the change."

The action taken by Claus Spreckels in entering the new combination, after declaring that he would fight to the last, is so strongly characteristic of American political and commercial action as to make us recall with a feeling of amusement much that was written by their late highly accomplished countryman, James Russell Lowell, in the celebrated

“Biglow Papers” about the politico-commercial conduct and creed of so many in regard to the slavery question.

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INSECTICIDES AND FUNGICIDES, AND THE APPARATUS FOR DISTRIBUTING THEM.

[MAGAZINE OF SCHOOL OF AGRICULTURE.]

Many insects and fungi, destructive to cereals, from the nature and time of their attack, cannot be directly dealt with and must be left to their destructive works though there are indirect means of preventing their appearance. In the case of the fungi known as smut (*Ustilago Segetum*) and rust (*Uredo-graminis*), nothing has yet been found of avail after they have appeared, though sulphate of copper, applied to the plants when young, will almost probably keep them off.

Wireworms, the grubs of the click beetle, (*Elatер lineatus*) can be hindered in their destructive work by dressings of gaslime, at the rate of ten hundredweights per acre ploughed into the land. Top-dressings put on the crops at an early stage, consisting of soot, from twenty to forty bushels per acre, or guano, from one and a half to three hundredweights per acre, or nitrate of soda, one to two hundredweights per acre, have been found valuable, acting as plant stimulants, as well as by keeping the insects off the plants. Salt put on at the rate of from four to six hundredweights per acre is also useful as tending to make the neighborhood of the plants unpleasant. After all these applications the land should be well rolled.

In some seasons the plant louse (*Aphis granaria*) causes much harm, first by exhausting the juices of cereals, and later by getting into the ear and doing much mischief. When it is seen that this aphides are on the plants in large numbers, it is well to apply a wash of soft soap and quassia, in the proportion of seven pounds of soap to an infusion made from six or seven pounds of quassia chips to one hundred gallons of water. This should be sprayed on with an efficient spraying machine before the plants get too high. Again, paraffin solution might be used, made of three quarts of paraffin to one hundred gallons of water, with four or five pounds of soft soap, or paraffin pure and simple distributed at the rate of from two to three gallons per acre. Aphides

multiply with incredible rapidity ; early dressings may therefore effectually prevent a bad attack.

For the eel-worm (*Tylenchus devastatrix*) which makes the bases of the stems of cereals swell, and plants unhealthy and unproductive, applications of sulphate of potash, at from one to two and a half hundredweights per acre, have been found most useful, and a mixture of two hundredweights superphosphate, and one hundredweight each of sulphate of potash and sulphate of ammonia per acre have been found of benefit.

Almost similar remedies to those employed against wireworms may be used for the grubs of the daddy-long legs (*Tipula oleracea*) and its congeners (*Tipula maculosa*, etc.) when they infect cereals. All these dressings of manure and preventive substances may be put in by the hand, or with ordinary broadcasting machines, or with the Strawsonizer, whose powers of distribution are generally acknowledged. One great advantage of this distributor is that as little as half a bushel of powdered substance can be put on per acre, and as small a quantity of liquid as a gallon per acre if desired. In many cases of insect and fungoid attacks upon plants, the great object in spraying is to spread the obnoxious substance all over the leaves in the form of a mist or dense fog. A very small quantity suffices to make the plants objectionable to insects and fungi.

For the mustard beetle or black jack (*Phædon betulæ*) the following is serviceable : five pounds soft soap well dissolved in water, extract of five pounds of quassia boiled, one hundred gallons water. Paraffin and soft soap compositions, and quassia and soft soap washes have been tried with advantage to prevent and check the onion fly (*Anthomyia ceparum*), the celery fly (*Tephritis onopordinis*), the carrot fly (*Psila rosæ*), all of which work great destruction in vegetable gardens. These remedies may be put on with garden engines fitted with nozzles like the Rily, the helmet spray, the Climax, and Stott nozzles, or with the "knapsack" machine, of which there are several patterns in use. The best of these seems to be the Eclair which is about two feet high, and consists of a copper reservoir, or vessel, holding twenty-six pints, made to fit on to the operator's back, being fastened there with straps like a knapsack. A rod traverses the lower part of the reser-

voir inside, being worked by a lever with the operator's hand. This does not move a piston as in ordinary pumps, but acts upon an indiarubber diaphragm, by whose sucking action the liquid is forced through the delivery tube with great force. With the Vermorrel or Riley nozzle the liquid can be delivered in the finest spray, or almost in single jets, and in any direction. For high trees the delivery hose can be lengthened by being attached to a light wooden or cane pole and directed by a boy. The machine will throw a spray from twenty to twenty-five feet and a jet thirty feet high. It weighs about forty pounds when full and costs 35 shillings. The Eclair is sold in London by Messrs. Clark & Co., Windsor Chambers, 20, Great Street, Helens, E. C.

The onion crop—a source of much profit—also suffers greatly from the onion mildew (*Peronospora Schleideniana*). Sulphate of copper solutions will prevent this attack if put on just as the bulbs begin to swell. In preparing, dissolve the sulphate of copper (five pounds) in a wooden vessel in three gallons of boiling water; in another vessel the lime (two and a half pounds of quicklime) is put with four or five pints of water, and when slaked four gallons of water are added and the whole well stirred. This is then poured into the tub containing the sulphate of copper, being passed through a sieve to keep back the particles of lime. The whole is well stirred and water to make up twenty-two gallons is added.

Another and a weaker preparation is as follows:—The sulphate of copper (three pounds) is dissolved in cold water by hanging it in a coarse bag or basket in a tub. In a separate tank the quicklime (one pound) is slaked and passed through a sieve and put into the tub with the sulphate of copper, and the whole well-stirred. Water to make up twenty gallons is added. The tomato is much affected in some seasons by a fungus of the family *Peronosporææ*, and sulphate of copper preparations have been proved to be efficacious against this. The solutions may be put on with the Eclair machine. Sulphate of copper may be used in the form of a powder for mildews (fungi) of various kinds. A good preparation of this consists of sulphur 50 parts, quick lime 3, sulphate of copper 10, coal dust very finely crushed 37 parts.

Another powder (the Skawinski, obtainable of the manufacturer of that name, at Lesparre, Medoc, France, for about ten shilling per hundredweight) active against fungoid attack, and used for vine mildew, is composed of forty pounds sulphate of copper, six pounds quicklime, 154 pounds coal dust finely ground. This may be put on with a soufflet or bellows which is a very useful means of distributing powders on a small scale for insect and fungoid attacks. A handy pail engine for small areas is Snow's patent universal garden engine, which may be fixed in any ordinary pail. The pump is very strong, forcing a powerful jet either in single stream or in thick fog. It is most easily worked.

The helmet spray before referred to, envelopes plants in the densest mist; the delivery can be regulated by turning a screw.

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THE MISSOURI BOTANICAL GARDEN.

[CORRESPONDENCE, N. Y. INDEPENDENT.]

The city of St. Louis possesses a public pleasure ground that is a monument to the wisdom and generosity of a single private citizen, the late Henry Shaw. This is the park known generally as "Shaw's Gardens," but the proper name of which is "The Missouri Botanical Garden." The origin and history of the garden are so peculiar that any description which omitted some reference to these would be incomplete.

Some fifty years ago, Mr. Shaw, then a prosperous merchant of St. Louis, found himself the possessor of as much money as he thought it desirable for any one man to accumulate. This sum was in the neighborhood of a quarter of a million dollars, the equivalent of at least a million now, as great fortunes were then comparatively rare.

Being wholly satisfied with this, and having no immediate family as an incentive to increase his wealth, Mr. Shaw retired from active business when barely past the age at which most men are just commencing.

The leisure of the few years following was employed in travel. Having some taste for horticulture, he was especially attracted by the great public gardens and magnificent private grounds that he saw abroad; and one day, when walking

through the elaborate grounds at Chatsworth, the idea came to him that he could not better employ his time and money than in establishing a similar garden in America.

The original idea was merely to establish private pleasure grounds, where he might exercise to the fullest his own taste for horticultural science, and where horticultural art might do all that could be done to adorn and make beautiful the surroundings of a home.

He had not progressed very far with the work before his plans changed materially, and he resolved to make it a garden for the study of and experimentation in economic botany, and in connection therewith to build up a park for the public.

This purpose became from that time the one occupation of his life; and until his death (in July, 1889), he devoted himself to this with the same energy that other men give to the business of making money or to the pursuit of a chosen profession.

At his death he not only gave the park to the public, but with it the bulk of all his other property, which, without any special effort on his part to increase it, had grown to considerably above a million dollars. The entire income from this goes to the support and improvement of the garden, so that it will be perpetually maintained through the gift of the donor.

The garden is not only a pleasure ground, but it is an educational institution as well. In its entire extent is embraced about two hundred and seventy-five acres, of which some forty-five acres are more directly devoted to economic uses. Of this latter the Arboretum occupies about twenty acres; the Fructicetum about eight acres, and the remainder is occupied by lawn, grove and vegetable gardens.

The Arboretum is devoted to the propagation of trees and shrubs that are needed for the adornment of the park, for testing others which are indigenous in order to discover their adaptability to the climate, and for bringing together as nearly as may be a collection of those which are native to North America. The park affords the best evidence of what has been accomplished in the garden, as it contains more than twenty thousand trees which have been transplanted

from the Arboretum. And as to the value of these as a representative collection, I may state that the late Dr. Asa Gray, than whom there was no better authority—said not long before his death that the variety of foliage to be seen here was unequaled anywhere.

The Fructicetum is maintained for the purpose of testing varieties of fruits, for finding the value of new sorts, and for determining the climatic adaptability of such as have not been grown in this latitude. Also for showing the proper methods of training and cultivating trees and vines. The vegetable garden has a similar purpose, and the whole serves as a school for students of botany and of the various branches of practical horticulture, as well as for visitors who wish to see how these things are done when they are done properly.

One object of the garden is to serve as a training school for practical gardeners; and to aid in this six scholarships have been established, yielding three hundred dollars each per annum, and which may be held for a term not exceeding six years. The garden students holding these scholarships receive free tuition in the School of Botany at Washington University (endowed by Mr. Shaw as an adjunct to the Garden), and instruction in practical and theoretical horticulture in the garden. The garden also possesses an extensive botanical museum and herbarium, comprising among others the valuable collections of the late Dr. Engleman, and well equipped laboratories for original work and research.

The collection of economic plants in the garden is very large; in 1886, when a complete list was compiled, it embraced two hundred and thirty-two species, and many have been added since. But this number gives little idea of the extent of the collection, as there were of named palms alone 106 varieties and 55 named varieties of agave.

Speaking of these "named" varieties suggests one feature of the park which might well be copied in other public grounds. This is the naming, by label, of trees and plants. Even the least curious person desires to know the names of things, and the question comes up at every turn in such a place. Here this want of the public has been remembered, and the visitor finds the question answered as soon as it is asked, and his pleasure and knowledge are thereby enhanced.

The question is not always prompted by curiosity, either, for often the visitor to such a place observes something which he would like to obtain for his own grounds; and if he cannot discover the name, he suffers a distinct loss.

The park is of more interest to the general visitor than is the garden proper, because more people desire to be amused than instructed. As a pleasure ground it can hardly be surpassed, being kept always in the highest state of cultivation and repair. There are wide, smooth lawns threaded with well-made walks and drives; heavy hedges of evergreen, clumps of ornamental shrubs, rows of native forest trees, artistic flower beds and bits of ribbon gardening.

There are charming bits of unstudied wildness which by contrast enhance the beauty of the whole; extensive green-houses filled with plants and flowers; pretty summer houses and arbors artistically placed: and some good pieces of statuary, among them a figure of Humboldt which should take first rank not only for its own excellence, but as a tribute to science which is worthy of the place.

The park is open to the public throughout the year except on holidays and Sundays; and twice upon the latter, once in June and once in September. That it is appreciated is shown by the numbers who frequent it upon every pleasant day, and by the fact that it is first among the places of interest in St. Louis to which the attention of visiting strangers is called.

Other cities have parks of greater magnitude and perhaps of equal beauty. But the people are taxed for their support. This is as free as the air they breathe.

We have seen many other splendid gifts to the public in recent years, libraries, art, galleries and public buildings, but none, I think, which is of such practical value to so many people. The park is something that can be enjoyed by young and old, by rich and poor, by learned and ignorant. One needs only the possession of his senses in order to get some good from trees and grass and flowers, and when these are given in the heart of a great city they are of double value. For generations yet to come this gift of Henry Shaw will be as great a boon as it is to-day; and it is difficult to imagine how money could have been spent for the public good and be more far-reaching in its effects. And, as I said at the begin-

ning of this sketch, it is a monument to his wisdom and generosity—far greater than any that could have been built from bronze or marble.

FRANKLIN, OHIO.

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THE SUGAR BEET INDUSTRY IN CALIFORNIA.

[FROM THE SUGAR-BOWL.]

Mr. Richard Gird, of Chino, California, who is now largely interested in this industry and who has the largest beet sugar factory in the State, in a recent gathering stated his experience in this new and promising branch of industry. Among other things he said :

Five years ago I commenced experimenting ; I planted as many as sixty experimental patches, running over an area of 20,000 acres, and as soon as the beets were large enough I commenced analysing. I learned to analyse for myself, and got the whole thing into my own hands, so that I did not have to depend on any outside chemist. The result was I became perfectly familiar with what the soils in different places would produce and the kind of seed adapted to those soils, by the following up of which I could expect to make a success of beet culture. I then cast about to find the capital to put up a factory with. The erection of a factory is a very expensive matter, and has to be done by practical sugar men. In the first place, it costs from \$500,000 to \$600,000 to put up a good factory, and in the second place, years of experience to run one. Well, I found the capital, and the result is I now have 4,000 acres, an area of one mile long and six miles wide, in sugar beets, growing as nicely as anyone could wish, and there is going to be a great crop on the Chino ranch this year.

All this we have had to cultivate as carefully as an onion bed—every weed being taken out of the ground. I now have 400 men and boys on my pay roll. Two years ago there were not, perhaps a dozen houses on the place, but at the last school census, just made, there were 310 children, which, according to the usual calculations, would make a population of from 1,300 to 1,400 people.

Beet culture is especially adapted for families; children are better at thinning beets than grown people. I have forty or fifty boys in a gang (boys about fifteen). with a man looking after them, thinning beets. A boy's fingers are more nimble than a man's, and they can get a better hold of a beet. As an illustration: A man came in this spring and took twenty acres, and his family has done all the thinning and hoeing, and his beets are in as nice a shape as could be found.

For the diversity of product and the employment of labor there is nothing equal to sugar beet culture. It takes at least one person to each ten acres after a patch is planted. You sow the seed very thick, as the beet has many enemies and comes up so weakly that it is necessary to put plenty of seed in the ground. I generally plant from twelve to fifteen pounds to the acre, according to circumstances. After coming up, the beets have to be thinned and weeded. I have now, probably 200 men and boys thinning and weeding, and am toward the end of the crop, having say two or three weeks more thinning. After this we have to cultivate, and for this we have special machinery, all of which I have made myself; in fact, everything I use of a special kind, I have made myself.

I advise anybody or any community as the first thing to do, if they wish to go into sugar culture, to experiment with their soils and get about ten varieties of the best seed that has been tested, both in Europe and California, plant in different patches around in their fields until they understand the capabilities of their soil for beet culture. I want to say right here that this is something the Agricultural University should take in hand, they ought to send an expert beet culturist throughout the State to teach farmers how to raise the sugar beet. Special business needs special training. The sugar beet is going to be our great staple industry in California; our country being so well adapted, both in soil and climate, to its successful culture.

The seed of the sugar beet for many years to come will have to be brought from Europe, although I have planted some to make a start with. It takes so much practical knowledge and requires so much care that I do not believe we will be able to take the matter up and realize a success until after

a number of years. The improved Klein Wanzlebener is adapted to shallow and clayey soil.

As a further illustration of suiting the different classes of beets to the various soils, I tried the beet they grow in Alvarado, but it would not do at all in Chino. I got four per cent. more sugar with these beets than with the Alvarado beet. The rule laid down by Vilmorin, who has been for many years a great beet seed raiser in Europe, is that the percentage of sugar is inverse to the weight of the beet. I can grow a beet as large as my finger so sweet that it will be just like a stick of candy. I had loads of beets on the Chino ranch last year that went 20 per cent. crystalizable sugar.

The proper weight to work for is $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds; a beet over three pounds is too large to carry a profitable per cent. of sugar. I want to illustrate to you the proportions of a sugar beet. A beet should be equalized so that the area of the leaf surface is in proportion to the root—sufficient to secrete the carbonhydrate from the air and deposit in the root. That is why we look for large tops and small roots. We produce a richer beet than they raise in other States of this country, because we have more sunlight.

The amount of seed that should be sown to the acre is about fifteen pounds. You cannot transplant the sugar beet. The trouble is, that in pulling a beet up, the point, which is very fine and easily broken, breaks off and sprouts, when the beet grows out of shape and is worthless. The worms this year cut off the points and destroyed large numbers of my beets. In thinning you should space according to the soils. I think from six to twelve inches—heavy, damp soils, about six inches; light soils, ten to twelve inches as the case may be. I give my orders for each field as to the distance to be left between the plants. It costs me \$1.50 per day per man, including board. The cost per acre is from \$14 to \$28. It comes higher in other places, but I think, on account of our dry climate, we get along cheaper, as we have less weeding and cultivating than elsewhere. The ground for all beets should be rolled. First plow, then roll.

The product should be about fifteen tons to the acre and the price obtained \$4.50 to \$5 per ton. Supposing you only get \$4 per ton, that would be \$60 per acre, and say it cost \$30

per acre, and if your families do the work, most of this can be saved. Say a man has ten acres. Without counting what he can save by his own and his families' work, his profit would be \$300.

Plowing and putting in of the beets take two months, and thinning and cultivating two months; that is, four months in the year. I am plowing now to put in beets where I have taken off this year $2\frac{1}{2}$ tons of barley hay to the acre, and on this same land I shall raise \$60 worth of beets to the acre. We generally calculate to leave the stubble on the land; still, last year I turned the land over again and put in beets. The plan is to plow the stubble in as a fertilizer.

Too much stress cannot be laid upon the benefit that the sugar beet culture is to the land in improving it for other crops. I have seen land that has been cultivated for 16 years, and the last crop was better in sugar than the first.

I feed the pulp to cattle and it makes splendid feed. My plan this year is to run it into silos and let it lie there about six months, and I calculate to feed it to my cattle during the winter months.

I expect to have 40,000 tons of sugar beets this year.

In plowing the land for beets, plow from ten to twelve inches deep. New land must not be plowed too deep; I found last year I turned up too much cold ground. You can till new land eight inches, next year ten and the following year 12 inches.

I have not touched upon the immense benefit the sugar business is to the whole country. We import \$100,000,000 of sugar into the United States every year. The Pacific coast alone uses 90,000 tons of sugar a year, you can estimate what that costs us. We can raise that ourselves just as well as not. Now Germany, an old, worn out country, thickly settled, ships 200,000 tons of sugar to the United States each year. These are figures we ought to think about. The drawing out of our country of this enormous amount for sugar is more than we can afford. There is a general complaint among commercial men and farmers about their being too little money and too little currency. The reason is we send too much of it abroad. If we can grow these things in the United States, we should do so, and thereby keep our money here and give

thousands of our own countrymen employment. I think the State ought to encourage this industry by giving a small bounty to farmers. They are offering it in Nebraska, Kansas and Iowa and all those Western States, and I think it would be proper to do so here. It will take 700 factories the size of the one we have at Chino to supply the United States with sugar; therefore there is no trouble to be apprehended on the score of competition; the more competition we have the better.

In California we have a great advantage in seasons for raising beets. On the dry land you can commence planting in February and March and the beet will go down deep, and is then in a position to stand almost any extent of drought.

California is a country where the planting season is long and the harvest season as well. I commence in February and continue planting till the end of May. I commence harvesting in the middle of July and keep on till December, whereas in Europe they only have two weeks for planting, and about 60 or 70 days for harvesting.

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COFFEE PLANTING IN GUATEMALA.

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Coffee trees, transplanted from the nursery after a year's growth from the seed, are usually planted 9 feet apart, making 484 trees to the acre; but where the soil is exceedingly rich, at an altitude of 3,000 feet above the sea, they are placed 12 feet apart to prevent interference with each other's luxuriant foilage. Each tree produces one to two pounds of the berry in "oro" (that is, after being cleaned and polished and ready for the market,) according to the soil and temperature; so that the product of an acre of coffee trees would be from 484 to 968 pounds in "oro." At the present price of 23c per pound the result would be \$111.32 or \$222.64 per acre, which, at the average cost of 5c per pound for production and transportation to the seaboard, would show a net profit per acre of \$87.12 or \$174.24, according to richness and adaptability of soil and condition of temperature.—*Exchange.*

PLANTERS' LABOR AND SUPPLY COMPANY.

INCORPORATED MARCH, 1882.

OFFICE—HONOLULU, HAWAIIAN ISLANDS.

ANNUAL MEETING IN OCTOBER OF EACH YEAR.

OFFICERS ELECTED OCTOBER, 1891.

A. YOUNG,	-	-	-	-	-	-	-	-	-	<i>President.</i>
J. B. ATHERTON,	-	-	-	-	-	-	-	-	-	<i>Vice-President.</i>
F. M. SWANZY,	-	-	-	-	-	-	-	-	-	<i>Treasurer.</i>
W. O. SMITH,	-	-	-	-	-	-	-	-	-	<i>Secretary.</i>
J. O. CARTER,	-	-	-	-	-	-	-	-	-	<i>Auditor.</i>

TRUSTEES ELECTED OCTOBER, 1891.

F. M. Swanzy,	W. O. Smith,	W. G. Irwin,
J. B. Atherton,	F. A. Schaefer,	H. P. Baldwin,
H. F. Glade,	A. Young,	J. O. Carter.

COMMITTEES OF THE PLANTERS' LABOR AND SUPPLY CO.

APPOINTED OCTOBER, 1891.

LABOR—R. D. Walbridge, C. Koelling, H. Morrison.
CULTIVATION—J. M. Horner, O. Unna, J. Renton, Jr.
MACHINERY—J. N. S. Williams, R. R. Hind, J. B. Atherton.
LEGISLATION—W. R. Castle, C. Bolte, F. A. Schaefer.
RECIPROCITY—H. F. Glade, W. G. Irwin, C. R. Bishop.
TRANSPORTATION—W. J. Lowrie, A. S. Wilcox, J. N. Wright.
MANUFACTURE—H. P. Baldwin, A. Young, T. S. Kay.
LIVE STOCK—W. C. Weedon, A. H. Smith, C. M. Cooke.
FORESTRY—T. R. Walker, G. N. Wilcox, W. W. Goodale.
FERTILIZERS—J. F. Hackfeld, W. H. Rickard, G. F. Renton.
COFFEE AND TEA—W. W. Hall, J. Marsden, J. H. Paty.
TOBACCO—J. Marsden, S. B. Dole, C. S. Kynnersley.
RAMIE—H. M. Whitney, B. F. Dillingham, E. C. Bond.
FRUIT CULTURE—L. A. Thurston, V. Knudsen, F. M. Swanzy.
STATISTICS—J. O. Carter, J. Austin, W. O. Smith.