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The latest quotation of Cuban centrifugals, 96° in New York Aug. 5th, was 3¾ cents. Sales of granulated had been made at an advanced rate, quotation not given.

D. Howard Hitchcock has a freak in the fruit line that certainly is worth mentioning, which grew and matured in his town garden. It is six pineapples all on one stem and all grown together as one solid chunk of fruit. It more than filled one half of the buggy seat on which it was lying.—*Hilo Tribune.*

The contracts between the Western Sugar Refinery and the Hawaiian Sugar Agents do not expire till the 31st of December. In the meantime arrangements will be made for the disposal of Hawaiian sugars, on as favorable terms for the planters, as the present contracts. Just what these will be has not yet been announced.

The new American tariff law was finally passed by Congress on the 24th of July, and became a law on that day. So that all goods entered on the 24th became subject to its provisions. Changes were made by the joint committee of the two houses in over 100 items. The American mail, due about the date of the publication will probably bring printed copies of the new law.

The Supreme Court of Michigan has decided that under the pure-food laws of that State any dealer making sales of adulterated food does so at his own risk, and is punishable, whether he knew it was adulterated or not, holding that the dealer must assume the responsibility of knowing whether or not the article for sale is pure or impure.

In their natural state the products of the orange blossoms serve to flavor drinks and sweetmeats, etc. When distilled they yield two very much esteemed products—the orange-flower water, or *aqua nanfa*, and an essential oil called *neroli*. Moreover, when candied, they form a very delicious sweet, much in vogue in some regions of Sicily. The orange-flower water is made of equal portions in weight of flower and water.

English chemists have lately discovered microbes in rum. These bacteria not only live but multiply rapidly in warm climates. The discoverers of these new insects are now engaged in studying their habits and chemical transformations, and have already made very important discoveries regarding them. If microbes exist in rum, may they not be found in any and every other kind of ardent spirits? It is certainly one of the most singular, if not important, discoveries yet made, in this branch of knowledge.

They tell this story of Lord Rosebery, who is a very bad shot: Not long ago he was on the Scotch moors, and having unsuccessfully fired at a covey of birds that rose not more than twenty yards ahead, he exclaimed: "It is strange that none of them fell; I'm positive that some of them must have been struck!" "I dinna doot," returned the keeper, with the usual freedom of his class, "that they were struck wi' astonishment at gettin' off sae easy!"

A gentleman, not unknown to fame, had left his corner seat in the already crowded carriage to go in search of buns and milk, or cake and sherry, leaving a rug to reserve his seat. On returning he found that, in spite of the rug and protests of his fellow passengers, the seat had been usurped by one in lady's

garments. To his protestations her lofty reply was: "Do you know sir that I am one of the director's wives!" "Madam," he replied, "were you the director's only wife, I should still protest."—*Exc.*

Ewa plantation has just finished its crop for 1897, with a total output of fourteen thousand nine hundred and forty (14,940) short tons, which is believed to be the largest crop ever turned out from one mill on these Islands. The great Spreckels plantation on Maui, during the managership of Geo. Williams, reported about 14,000 tons, which was the largest output here, till Ewa surpassed it. Manager Lowrie has evidently learned the art of how best to grow cane, how to extract the most juice, and how to secure the largest amount of sugar obtainable from it. If everything works as well next year as it has this, Ewa mill will turn out 16,000 tons of sugar.

The following publications have been received and may be found at the Experiment Station in this city:

Notizblatt des Konigl botanischen Gartens und Museums zu Berlin, June 1897.

From the University of California—The California Vine Hopper.

From the same—Control of Temperature of Wine Fermentation.

The Rural California for June and July is a supurb issue, devoted to California's products and illustrated with over forty fine half-tone plates of scenery and the leading men of Southern California.

Packing Seed Canes for Shipment.—The late Charles N. Spencer, who had considerable experience in packing sugar canes for shipment, gave the following method, which proved very successful. Take half-barrel sugar kegs for containers, cut the canes of proper length to fit in tight: dip both ends of each stalk in common mucilage, and cover the ends with paper, which will adhere closely, and exclude the air. This should be done immediately after cutting the stalks. Pack the stalks in the keg with sawdust, which has been thoroughly dried in the sun.

This drying is very important. Bore auger holes in the top or head of the keg. See that the package is put on board in a dry and airy place of the ship. In one shipment to Australia and another to the United States, packed in this way, every eye turned out good and sprouted. Should the eyes appear dead or withered on arrival, soak the cane in water for twenty-four hours, and often they will recover the power of vegetation. A portion of the leaves, (a few inches in length), should be left on the stalks, to protect the eyes from injury by chafing or handling.

Professor Nobbe, of Saxony, the distinguished plant physiologist, claims that he has produced, "on a commercial scale, pure cultures of the different bacteria, which are efficient in affixing the nitrogen of the air in a form available for plant-food, and he has them for sale in small glass bottles. It is claimed that soil can be inoculated with these organisms for the modest sum of one dollar and twenty-five cents per acre." This seems like a flattering dream, but it is probable; and already it has been made the subject of several papers read before the Royal Agricultural Society of England. There is one class of minds that will hail the discovery with delight, as showing how everything has its own separate, positive purpose in the scheme of creation, and is not, as it were, apologized for as a side issue by the lecturers on chemistry, who say: "Nitrogen is a mere diluent; without it oxygen would be destructively vigorous;" and now when we can hope that the *diluent* is a great storehouse of the food that the plant must have, and that a class of beneficent bacteria are the agents of its transformation, we can cease to worry, at least for a time, over the impoverishment of the soil, which gives the pessimist an excuse for one of his most unpleasant prophecies of evil to come.—*Exchange.*

European Sugar Bounties.—Senator Vest, in the course of some remarks made in the U. S. Senate, said. "The encouragement given in bounties by continental countries has resulted in over-production abroad, and in so depressing the world's sugar markets, that since the enactment of the present law, prices of sugar have so declined that our revenues have fallen away more than a third below what was computed these rates would

yield at the time the law was passed, and has so cheapened sugar to the consumers that they have hardly noticed the burden, which 40 per cent. on this necessary of life has imposed. It does not seem possible that prices can go much lower than now, but our Consul General at Frankfort, in the February Consular Report (page 167), shows that the new legislation in Germany, instead of reducing the trouble as anticipated, by reason of the same tendencies of greed grasping benefits that prevail there as here, has exaggerated the embarrassments and encouraged still more burdensome over-production in Germany, and France retaliates with like legislation. The result is, that while the Germans can only afford 12 or 15 lbs. of sugar per capita annually for home consumption, they help England and the United States to pay for the 50 or 60 pounds per capita consumed in these countries.

Senator Caffery also spoke as follows:—"I think the condition in Germany, France, and in the Continent of Europe, generally, where beets are raised, are quite as favorable as they are in the United States. I find that after some forty years of protection and bounty the beet sugar industry is toppling to its fall. I find that at every single session of the German legislature there is a demand for more and more bounty, and that while the Germans are apparently prospering in sugar culture, they are paying more for sugar than it is worth. They pay about 3c. a lb. additional to the price paid by the consumer in the United States and Great Britain. I find that while they pay this excessive price, the consumption is not over one-third of what it is in United States. I therefore conclude that if this artificial culture of the beet—I call it artificial, because I do not believe it is natural—can be built up to the proportions of the beet crop of Germany and France and Sweden and Norway and Belgium and other countries of Europe, the consequences may be, and likely will be, precisely similar to the consequences that have befallen the beet culture in Europe. In other words you make cheap sugar for the foreigner and you make high sugar for the home consumer. You will put it so that they cannot consume sugar. The same sugar that sells for between 7 and 8 cents a pound in Germany the American gets for 4 and 4½ cents. If it is the object and design of the Tariff

in this bill to stimulate that production just precisely as it has been stimulated abroad, the same result will follow, and the beet growers will be constantly threatened with annihilation. Multiply the German population by the amount of 3 cents a pound, and if they consumed as much sugar as we do in the United States, it would be from $50,000,000 to $60,000,000 per annum for the privilege of raising sugar. I do not believe the game is worth the candle."

INFORMATION FOR IMMIGRANTS.

Letters are frequently received by us as well as by others, inquiring about the chances for obtaining land by purchase or lease in small or large tracts, with the view of settling and making a home here. Persons receiving these inquiries often find it difficult to ascertain just what the writer wishes, and consequently are unable to furnish satisfactory replies. They seldom state whether they are farmers, tradesmen, laborers, with or without a family, or whether they write out of pure curiosity. To some, the pamphlet issued by the Hawaiian foreign office, will probably furnish information to satisfy their curiosity, and to the foreign office their application should be directed. Still, a few lines here may not be amiss.

Government lands or homesteads can be secured by purchase at the sales occasionally held, or by lease, on application to the land office in Honolulu. These lands vary in size from ten to one hundred acres or more, and are adapted to the cultivation of fruits, grains, etc., such as bananas, rice, coffee, corn, potatoes, oranges, while some are better suited for pasturing cattle, horses, etc. Some are located in wet districts, others in dry, where often there is a scarcity of water, the supply being dependent wholly on rains. Many of the desirable locations are being taken by Chinese or Japanese, on lease or purchase, who manage to live on very little, while their pigs, fowls and small crops furnish an income to better their surroundings from year to year.

Coffee, oranges, and sugar require considerable capital. The latter calls for a great outlay, and many of the plantations have been consolidated into companies with large capital, from $500,000 to several millions of dollars. Coffee also requires considerable capital; but when a farmer or planter has money enough

to buy one hundred acres of suitable land, and carry on his farm with its improvements, till an income is derived from it, his prospect here is very good. Clearing off the land is the principal item at first. If it consists of forest land, the wood will sell for about or more than the cost of cutting it, as fuel is always in demand. The first year will generally be spent in making the farm ready for habitation and for planting whatever trees are to be set out,—coffee, oranges, bananas, etc. As to the cost of planting one hundred acres of coffee or any other trees, much depends on the farmer himself. If he is already accustomed to work of this kind, the expense will not be one-half, or perhaps not one-third what it will be, if he has to learn everything, and trust to inexperienced laborers or others.

Among the letters received, is one more explicit, and containing several inquiries regarding these islands, which we shall endeavor to answer, though on some points, there may be a difference of opinion, even among old settlers:

"As to the climate of Hawaii, can foreigners work in the field, or is it too hot?" Many who have never been here, have very mistaken notions of our climate. It is much hotter in Lower California during the middle of the day in summer, than on the uplands of Maui and Hawaii, where the heat is tempered with the cool trade winds. Ours is a healthy climate, and very few diseases exist here except such as have been brought from abroad by persons who have been troubled with the complaints before arrival. Farmers or laborers, who have been accustomed to hard work in America or Europe, can work in the field as well here as there, and probably will enjoy as good health.

"Can grains, such as wheat, oats, barley and corn be raised in Hawaii?" Yes. Wheat, oats, and barley can be raised here, but not so readily or cheaply, as in America. On this account, all the flour, and most of the grains known as horse feed are imported. Corn does well, and perhaps as well as anywhere in the world, and any farmer who raises his own corn here, can raise hogs easily here, and make money in the business. At present the bulk of our swine are imported from California, and fresh pork, though largely consumed by Chinese and others is very high. Hogs are always in demand, and as a minor industry, it is a paying business to raise them.

"Will tobacco, cotton and fiber plants grow well in Hawaii?" Yes, and probably as well as any where. Experiments have been made with tobacco, and while it grows luxuriantly, it has been found too strong for making cigars. A factory was started here for this purpose some forty years ago, and very handsome cigars were turned out, but they did not take, and the enterprise proved a failure. The cultivation of tobacco for making wrappers, similar to the Sumatra tobacco wrappers, it is thought, would do well, but it has never been tried on a large scale. Here is a branch of the business which may some day prove to be a successful venture. But the experiment should only be made by persons familiar with this business, and possessed of ample means. Cotton also grows well, but only the Sea Island variety has ever been found remunerative, and this was during the American civil war, when the price of cotton was very high. All the fiber plants grow well here, such as ramie, sisel, sanseveria, etc., and in this line, there is a fair opening for the investment of capital. The improvements that have been made in the milling and cleaning of ramie, render this branch of business a safe opening for the investment of capital, and no better place can be found than here on Hawaii.

"How about labor, can it always be had?" There is no scarcity of labor for farming purposes, and for almost any branch of field work, it can generally be had at from $13 to $20 per month. The laborers are Chinese, Japanese, Portuguese and Hawaiians. As a general rule they are easily managed and contented, when satisfied with their wages. On the plantations, where large numbers have to be kept, contracts are made, to prevent their leaving, when their services are most needed. Only about one-quarter of the laborers employed on these islands are under contracts, and they are generally persons lately arrived, who could with difficulty be identified, if they quit service.

"What are the taxes?" They average about the same as in the United States, personal taxes being say five dollars for each male. Property tax one per cent. on its fair valuation. Vehicles and animals pay a small tax. There is a tax of two dollars for public schools, but this is included in the above five dollars. The taxes are considered as moderate and not excessive, being on a basis of one per cent. All goods imported pay an import duty

of from ten to forty per cent. But in case of annexation, all importations from the United States will be free, of course. The revenue of the Government at present from this source is about $600,000 per annum.

"Do you have good schools?" The Government schools, of which there are some in every district or settlement on the islands, are sustained at the public expense, and all children between six and fifteen years of age, are required to attend, and are taught in the English language only. There are also private select schools, at which the tuition varies from fifty cents to one dollar per month. There can be no complaint on the score of schools, as there are few countries in which more attention is paid to the education of children, than Hawaii. As a result, all who have been born here, are at least able to read and write, which is not the case in other and more favored nations.

The above brief notes ought to furnish any inquirer abroad with a tolerably correct idea of what he would find, if he migrates to Hawaii. The population of this group is about 110,000 of which total about 25,000 comprise Americans and Europeans, speaking the English language, which is the language of business and of the government and country. Even the native Hawaiians, who are steadily improving from year to year, in habits of domestic life, clothing, etc., are rapidly acquiring the use of English, and it will not be many years before the English will supersede Hawaiian, as their common medium of intercourse.

SPONTANEOUS COMBUSTION OF MOLASSES.

We are indebted to Mr. J. T. Crawley, of the Hawaiian Experiment Station, for a pamphlet, being a reprint of an article written by him and published in the Journal of the American Chemical Society for July, 1897, relative to the analysis of charred molasses sent to the laboratory from the Hamakua Mill on Hawaii, as narrated in the following extract:

Early in September of last year a sample of charred molasses was forwarded to the laboratory of the Hawaiian Experiment Station from the Hamakua Mill, Hawaii, but owing to stress of work it was not examined until quite recently. The following extracts are taken from the letter from Mr. William McQuaid,

chemist at the Hamakua Mill, which accompanied the sample. "The molasses in question was boiled to what is known as "string proof," at a temperature of 160°-165° F., and run into an underground cistern from time to time until the molasses was within six or eight inches of the top of the cistern, when the walls cracked, and the molasses began to leak out. The molasses continued to leak for about one and a half months, during which time five or six feet of the molasses was thus lost. That which remained seemed to be in a perfect condition. Five days later, however, it was found flowing over the sides of the cistern in somewhat of a burnt state. The temperature at the point where the molasses flowed over was 92 deg. C., but in the cistern, and especially where the crack was located, this boiling seemed to be more violent.

"This flowing continued for about twelve hours, but the molasses continued boiling within the cistern until there was left nothing but a few feet of charred mass. The fumes given off affected the eyes very much, and coming in contact with the metal roof formed a salt."

The sample of char formed under the above conditions was tested with a view of establishing the probable degree of heat at which the changes took place, as also to find the origin of the heat. Parts of the sample were quite black, having somewhat a ropy feel and consistency; other parts were dry, brittle, vesicular masses, brownish in color, resembling very much vesicular lava, while still other portions were of a much lighter color, the decomposition having gone so far as to drive off almost all volatile products, leaving a residue of carbon, ash, etc. * * * The phenomenon can have been nothing else than spontaneous combustion, the acid products being oxidation products, and therefore having lower thermal values than the original sugars. The successive stages of oxidation and decomposition furnished the heat necessary to carry the whole mass to the next stage. As to the initial cause of the rise in temperature, little can be said; the high water content and known fluidity of molasses would tend to retard decomposition by oxidation. It is a fact well known among practical sugar-house men, that if a molasses of low grade be boiled at a high temperature and run into coolers it is very apt to froth and foam, and run over the sides of the containers. It is also known that running successive charges of hot

molasses into the same container will often result in a burning of the product and foaming over the sides of the container.

The cause of this foaming and frothing is not positively known. Fermentation often proceeds in a very thick molasses, in fact at a much higher density than is generally known, and the escaping carbon dioxide would tend to cause the mass to rise up. I am inclined to believe, however, that in the majority of cases this frothing is due to decomposition of the non-sugars. This is a subject that will be looked into. Whatever may have been the initial cause of heat, whether fermentation or decomposition due to the treatment, there can be no doubt that there was a violent manifestation of heat most destructive in its effects."

Editorial Remarks.—This incident of burnt molasses from Hamakua reminds us of another occurrence, some twenty-five or thirty years ago, when the Ulupalakua plantation on Maui was in operation. As near as we can recall the incident, the facts were these: The molasses from the sugar house—and there were much larger quantities of it in those days than now—was allowed to run off as waste into a large cave near the mill. This stream must have been running for several years, and it was supposed that the molasses was lost among the rocks and crevices of the great mountain Haleakala, on the slope of which Captain Makee's plantation was located. One night the watchman discovered a dense smoke issuing from the small mouth of this cave, followed soon after by brilliant jets of flame, which occasionally shot up, very much as the flame of the lava is occasionally seen issuing through a crack in the ground during an eruption of the volcano. He became frightened and gave the alarm that the volcano of Haleakala had broken out again. The whole neighborhood was suddenly aroused, and seeing the flames darting up, the men rushed for buckets, while the hose was attached to the cistern, and water was pumped onto the fire, with all the force that the plantation could bring to the rescue. The more water that was poured on, the brighter the flames glowed, till it was found to be quite useless to attempt to extinguish them.

Reports spread to the surrounding villages, and the people flocked from far and near to see the new volcanic wonder. The theory was at length suggested that it might be only the molasses, which from some unknown cause had caught fire, and no avail-

able means were at hand sufficient to extinguish it, the supply of water being limited to several small cisterns. This fire continued to burn for several weeks, and at times caused considerable alarm. The waste molasses from the mill had been running into the cave for several years, and the quantity of it stored there, dried and liquid, must have been considerable, furnishing lively material for a "nine days' wonder." Chemists were not so numerous here then as they are now, and we are not aware of any analysis ever having been made of the lava of this miniature volcano. It, however, formed one of the most interesting and amusing incidents of the early days of sugar making on these islands, and clearly demonstrated that molasses will burn, making as good fuel, and as hot a fire as coal, when given the requisite conditions.

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A NEW QUADRUPLE EFFECT.

As an evidence of the skill of Hawaiian mechanics and the progress that is being made here in the manufacture of sugar machinery, no better illustration could be offered than the exhibition of the complete quadruple effect, that was shown lately in the establishment of the Honolulu Iron Works Company, made for the Lihue mill on Kauai. The whole effect was set up on an iron stage, twelve feet from the ground floor, and was a most imposing piece of machinery, occupying a floor space 48 by 17 feet, and 30 feet high, its weight being about 150 tons of iron and 20 tons of copper.

For the benefit of those who are not familiar with the construction of such machinery, and as showing how much labor and material is required in its construction, we insert the following description of this particular quadruple effect.

There are four cells of the same dimensions, 8 feet inside diameter and 15 feet high including the bottom and top part. They are made entirely of cast iron $\frac{3}{4}$ inches thick, with tubes of drawn copper expanded in brass tube sheets. There is no inside drum, the tubes are placed close to the shell and the circulation of the juice is caused by a large center copper tube, and the thin juice made to enter this tube in the center, giving it a downward direction. The vapor and steam enter the tube system evenly on

all sides through an annular enlargement in the lower belt of the cell (steam jacket). This arrangement of the tubes has made it possible to obtain a heating surface of 9,500 square feet. The pipe systems for vapor, steam and juice are arranged as usual in the multiple effects made here, so that either of the cells can at once be cut off from communication with the other, if this should be necessary for repairs or cleaning, and the other cells continue the work either as a triple or a double effect. All the vapor pipes conducting vapor to the save-alls are made 24 inches inside diameter, while the vapor pipes into the cells are made 18 inches. All the exhaust steam pipes to first and second cells are 7 inches, with 2½inch pipes for direct steam, and all pipes conducting juice are 4 inches. The save-alls are arranged with copper baffle plates, in such a manner that the vapor is forced downwards; when it enters the outer chamber before it can ascend to the top of the inner vapor pipes leading it to the next cell, thereby lessening the chance of entrainment. The condenser is comparatively large in diameter and located over 35 feet above the floor. The injection water is drained off from the bottom through a "water leg," and the vapor and air drawn off from the side to a "dry" air pump. The drain pipes from the steam chambers are taken out from the side near the bottom, there being no bottom tail pipe, and arranged so that they can either be drained by the air pump or by a separate small pump for each cell. Any accumulation of gases in the top part of the steam chambers may be drawn off to the next cell through pipes for this purpose and finally end in the air pump. The space under the bottom tube sheet is large enough to allow any tube to be expanded without taking down the bottom part of cell. There are baffle plates fitted over the central bottom outlet for thick juice, so as to prevent a rush of thin juice into that pipe. The cells, save-alls and vapor pipes are all covered with a wooden lagging, held by polished brass bands, and each cell has a complete set of mountings, such as windows on front and the rear. Thermometers, vacuum and steam gauges, juice test cups, tallow cups, etc.

When we add that a large part of the work on this splendid piece of machinery has been done by native Hawaiians, who in some kinds of heavy work have proved fully as skillful as Americans or Europeans, our readers will need no other proof that na-

tive Hawaiian mechanics are well fitted to become worthy citizens of the great Republic. The same remark will apply to many of the workmen employed on our various factories and mills, and these establishments should be visited by skepties, if they wish to see proof positive on this subject.

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EARLY INTEREST IN THE BEET SUGAR INDUSTRY IN THE UNITED STATES.

[Louisiana Planter.

It is commonly believed that attempts to introduce the beet sugar industry into the United States are of recent origin, dating back at least not more than twenty-five years. I have lately had my attention called to a report made to the Beet Sugar Society of Philadelphia on the culture of the French sugar beet and the manufacture of beet root sugar in France. This report was written by Mr. James Pedder, the agent of the society, who was sent to France in the spring of 1836, and returning, made his report to the society in August of that year. From the preface to this report it appears that in 1835 James Ronaldson, Esq., who was the first president of the Beet Sugar Society, had been giving his attention to the subject of introducing the beet sugar culture into the United States. Through the instrumentality of John Vaughn, Esq., and the exertions of Mr. Jacob Snider, the secretary of the society, Mr. Ronaldson was made acquainted with Mr. James Pedder, a gentleman who had both in this country and in Europe given attention to the subject, and who had watched with interest the progress of the French in perfecting the manufacture of beet sugar. Mr. Pedder was engaged as an agent of the society and commissioned to visit France for the purpose of gathering information which might be of use to the furtherance of his purposes.

It appears that the Beet Sugar Society of Philadelphia was organized on the 16th day of May, 1835. Through the efforts of the society a great interest was aroused in the country, extending as is said in this report, "from Louisiana to Maine, as the public prints and various inquiries testify." In the latter part of May, 1835, 600 pounds of the seeds of the true sugar beets were purchased in France and transmitted to Philadelphia. All the expenses of Mr. Pedder's trip were paid by the association, and as a

partial reimbursement therefor they found it necessary to charge a small sum for the printed copy of the report. The only copy of the report which is known to exist is contained in a volume of pamphlets belonging to the library company of Philadelphia, and presented to that association by Margaretta A. Dick, in memory of her father, Walter B. Dick.

Mr. Pedder sailed from Philadelphia on the 8th of February, 1836, landed in Liverpool on the second of March, reached Calais on the tenth of the same month, and Paris on the thirteenth. One of the most interesting parts of his report is the account of his visit to a small manufacturer, Jean Joseph Lecerf, who had succeeded in preparing sugar on a very small scale.

Mr. Lecerf had set up a sugar factory in his front parlor, where he had contrived to manufacture during the season 1,000 pounds of sugar by means of machinery the most simple imaginary. The whole cost of the machinery did not exceed 500 francs ($100). In the fire-place of this room he had fixed his defecator, evaporator and boiler. His wife's washing tubs served as receivers and coolers, and a single sugar pan was sufficient for the reception of his whole day's working. His rasp made 400 revolutions per minute, and was driven by two of his sons. In this way, Mr. Pedder says "he actually made good sugar, but his knowledge not extending to the purifying process, much of it remains on his hands unsalable. On my inquiring how long each process required before its completion, he replied, 'I can not say, for our operations were often completely stopped by the crowds which came to witness them, but we sold large quantities of beer and brandy, by which I did well.'"

Our ideas of a sugar refinery have grown somewhat since Mr. Pedder's time, because he says: "At Valenciennes I visited the large refinery for beet sugar, capable of preparing 2,000,000 pounds annually."

At this early date the Germans had evidently had their interest aroused in the beet sugar industry of France. At Arras Mr. Pedder met Professor Schubarth, of Berlin, who, with Mr. Reish, had been deputed by the Prussian Government to examine into the mode practiced in France for the production of sugar from the beet. Mr. Pedder says: "From Professor Schubarth I learned the fascination which is spreading over the whole con-

tinent on the subject of beet sugar; he considers that, when well made, it is equal in every respect to that made from the cane, and that it can be manufactured to great profit, particularly in a national point of view."

After the time of Napoleon the First the manufacture of beet sugar was almost abandoned in France. Mr. Pedder says: "To Monsieur Crespel Delisse the country is mainly indebted for the continuance of the fabrication of sugar, as it had been all but abandoned; he and the Duke of Ragusa (Marshall Marmont) being almost the only persons determined to pursue it to the end. For his perseverance and skill he has obtained from his country a token of the order of merit, and is denominated 'the father of the beet sugar manufacture of France.'"

The process employed in France at that time for manufacture were exceedingly simple. The roots were cleaned, reduced to a pulp by a rasp, and the pulp submitted to hydraulic pressure. The clarification of the juice was accomplished in the manner still pursued for cane juices, viz., by adding lime to exact neutrality and heating. The scum and sediment were collected and pressed in bags. The evaporation was conducted in an open copper pan. The decoloration of the syrup was effected by filtering through granulated animal charcoal, and the final concentration conducted in an open pan until the crystalizing point, viz., 41 deg. by the saccharometer, was reached. The syrup, when the crystalizing point was reached, was poured into flat pans made of tinned iron, 2 feet 3 inches long, 15 inches wide and 3½ inches deep, where it was left for twelve hours. The pans were then removed to a warm room and set on their ends, in order that the molasses might drain out, and were left for twelve days, when the sugar was fit for the market.

Mr. Pedder is of the opinion that instead of following the plan for reboiling the molasses and obtaining a second crop of crystals, it would be far more profitable to feed the molasses and obtain the results in the shape of beef and mutton. This, I believe is the first recorded instance of advocating the feeding of molasses. Mr. Pedder states that he has known instances where as high as 8½ per cent. of moist sugar on the weight of the beets were obtained. About 6 per cent. he regards as the average yield. He estimates that the cost of sugar to manufacture was

4¼ cents per pound. The pressed cakes containing the residue, after the extraction of the juice, were preserved in silos, or, as Mr. Pedder states it, "the cakes are preserved in magazines sunk in the ground, where they are beaten hard and left to ferment." It would be difficult at the present day to describe a silo in fewer or stronger words.

In regard to manures, he says that an abundant supply is found in the farmyard, and that the refuse of the sugar houses is used as a top dressing for clover. Bones, he states, are too valuable to be used for manure, as they are required for clarifying the sugar. Lime is not in use except for strewing the floors of the sheep sheds, where it becomes one of the richest and most valuable manures known. He states that a good yield of roots is 40,000 pounds per acre. He estimates that the cost of a first-class sugar house for making beet sugar on the most improved plan is about $5,200. With that plant sufficient to employ thirty men and women, he states that from the 10th of September to the 15th of April about 110,000 pounds of sugar could be made.

The days of the hoax in sugar manufacture evidently commenced early. At Valenciennes Mr. Pedder learned of a large manufacturer who had purchased for $10,000 a secret by which he was preparing sugar without molasses. On inquiry, however, the gentleman admitted that he had been offered the secret for the sum mentioned, but he had declined it, proposing, however, to give the thing a fair trial, but he found that at the end of six weeks he was making nothing but molasses. He believes that the person who claims to be the discoverer of this mode of working has collected a large sum by way of subscription; but to prepare loaf sugar from the beet by a single and first process and to make sugar without molasses he considers to be impossible in the nature of things. If this gentleman could return to earth at the present day and see the modern processes whereby the production of molasses in the beet sugar factory is practically suppressed, he would realize that $10,000 would be a small sum to pay for the real secret of the process.

Extracts from Mr. Pedder's journal are appended to the report. On April 6 he mentions a fact of interest to the American manufacturers, viz.: "The American pump is in use at the sugar houses and is universally approved."

On April 28 he quotes an extract from a French paper to the effect that the people about Berlin are gone beet sugar mad. The farmers are giving up the cultivation of grain and are turning their land to the growth of the beet sugar. This is in consequence of the report of Professor Schubarth on his return to Berlin on the present state of the beet sugar manufacture in France.

On May 6 he said he visited the dairy cows at a sugar house, and found them in excellent condition, fed with molasses, straw and beet cakes.

On May 14 he mentions an item which would be of interest to the examiners in the patent office, viz.: Syrup for cleaning or washing sugar in pots may be made by reducing brown sugar with water at 21 deg.; about a pint and a half is to be poured through flannel on the top of each pan and suffered to flow out at the bottom; one, two or three washings to be given, as required. I believe this process of making white sugar is still protected by patents in this country.

On May 18 he describes the primitive methods in the manufacture of animal charcoal.

A novel rolling apparatus for leveling the soil is described under date of May 21, when "at Cambray, weather fine and all hands busily engaged in sowing beets; I saw a woman with large boards fixed on her feet, walking over the land to save the expense of rolling."

Under the same date he states: "The poetry of beet sugar making is gone out. It no longer is made to distill in lumps of double refined, and fall into your coffee without cost or labor, but it has left all that any sober-minded man had a right to expect. If three acres of beets can be cultivated at a profit of 900 francs, and yield 7,200 pounds of molasses and 18,000 pounds of cakes, sufficient food from the cakes and molasses to fatten sixty sheep and raise manure for future crops—all above this must be mere poetry.

Under date of May 27, departing a little from his subject of the sugar beet, he describes visiting a chicory farm near Valenciennes, where "the roots are cut into small square pieces, and baked until they contain a fine brown color. They are then ground in a mill and sent to the countries in which dyeing is

performed. The taste is extremely acrid and unpleasant, yet large quantities are used in coffee; for what purpose it is not easy to conceive."

The intimate relations existing between sugar and legislation are noticed under date of May 28, where it is stated that Leopold, King of Belgium, and son-in-law of the King of the French, in expectation of the taxes on beet sugar in France, has invited the cultivators of that crop to settle in his kingdom, where they will meet with every encouragement, and be guaranteed freedom from taxation in their business.

Quoting from a French paper on the same date, he states: "The making of beet sugar, for which the population of France have shown a wonderful aptitude, is a kind of god send that should be taken advantage of for the uniting together of agricultural and manufacturing art. The whole system of the law for imposing duties on beet sugar is bad, it starts from false ideas, and leads to most lamentable results."

It is a long while since I have read so interesting an article on the beet sugar industry as this native report of Mr. Pedder, and I have already trespassed too much upon your space. I must be permitted, however, to make one more quotation from his dairy of May 29, as follows:

"The production of sugar from the beet is not the only or the most valuable result to be derived from its cultivation; it would appear that almost as much stock can be kept upon the refuse of an acre of beet as upon the crop before crushing; this is accounted for by the circumstance of the extreme palatableness of the molasses, which turns to the most delicious food what was once considered fit only for the bedding of cattle. The spirit of industry which it engenders, and the power of reproduction which is contained in the large quantities of manure arising from such a system of feeding, are amongst the first of its advantages, while the increase in the value of land suitable to the growth of so invaluable a crop must be of primary importance. America is destined to take the lead in the production of silk and sugar, as she has already done in cotton, rice and tobacco."

From the above excerpts it will be seen that nearly all the problems which now confront the sugar industry were touched upon, to a more or less extent, by Mr. Pedder in this remarkable report

of his observations on the early methods of the growth of sugar beets and the manufacture of sugar therefrom in France.

H. W. WILEY.

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MORE EFFECTIVE USE OF MACERATION-WATER.

The quantity of water, which can be used for maceration, is limited at all the mills in these Islands by the amount of bagasse available for fuel, and the evaporating capacity of the boiling-houses. We cannot, therefore, further reduce our losses in the bagasse by increasing the dilution; but we can increase the efficiency of the available water. This may be done by using the juice from the third mill for macerating the bagasse from the first mill.

The theory of maceration in general, and its application to the process of *double-maceration*, will be given at some length, as it clearly demonstrates that an increase of the extraction must follow the adoption of this process, whatever the quality of the grinding and the degree of dilution may be. By a similar calculation the amount thus to be saved can be ascertained at every mill where the necessary data are available.

In order to ascertain the proximate quantity of additional sugar extracted, the degree of the diffusive action of the maceration-water on the bagasse had to be determined.

The figure expressing this proportion will be termed the "*quotient of diffusion.*" If this quotient, the calculation of which will be given later on, be for instance 55, it means that 55% of the maceration-water completely diffused with the juice in the bagasse, while the remaining 45% merely diluted the juice resulting from this diffusion. In other words, 55 gallons of water would have done the same work as 100 gallons actually used, had diffusion been complete. Among the many factors influencing this quotient, the mechanical condition of the bagasse is the most important. It is evident that the coarser the bagasse, *i. e.*, the larger the bagasse particles, the less the sugar contained therein is accessible to the macerating liquid.

In the following I shall endeavor to show what the results of a given week's work would have been, had the above-named

mode of maceration been in operation, compared with the results actually recorded for that week's work.

Homogeneity of cane-juice is assumed, and glucose and soluble impurities are neglected for clearness of calculation.

$$\text{Mill-juice} = 98125 \text{ lbs.}$$
$$\text{Dilution \% Mill-juice} = 14.4\ \%$$
$$\text{Maceration-water} = \frac{98125 \times 14.4}{100} = 14130 \text{ lbs.}$$

	Sugar		Water	
	%	lbs.	%	lbs.
Bagasse II. 24500 lbs.	7.48	1832	44.17	10822
	S^2	S_2	W^2	W_2
Bagasse III. 22740 lbs.	4.28		44.08	
	S^3		W^3	

Wd, in this paper termed "Diffusion-water," stands for the amount of water necessary to bring the percentage of sugar in juice in bagasse II. to the percentage found in juice in bagasse III. It is evident that the proportion between the amount of water in bagasse II., plus the diffusion-water, is the same as that between the water % bagasse III. and the sugar % bagasse III.

Thus:
$$\frac{W_2 + Wd}{S_2} = \frac{W^3}{S^3}$$
$$(2)\quad S^3 (W_2 + Wd) = S_2 W^3$$
$$(3)\quad S^3 W_2 + S^3 Wd = S_2 W^3$$
$$(4)\quad S^3 Wd = S_2 W^3 - S^3 W_2$$
$$(5)\quad Wd = \frac{S_2 W^3 - S^3 W_2}{S^3}$$

Substitute the above data:

$$\text{Wd} = \text{Diffusion-water} = \frac{(1832 \times 44.08) - (4.28 \times 10822)}{4.28} = 8047 \text{ lbs.}$$

The previously mentioned Quotient of Diffusion expresses the relation between the diffusion-water and the maceration-water:

$$\text{Quotient of Diffusion} = \frac{8047 \times 100}{14130} = 57.0$$

The following will prove the correctness of the foregoing deductions:

Equation I.—

	Sugar lbs.	Water lbs.
In Bagasse II.	1832	10822
Diffusion-water (57% of Maceration-water)	——	8047
	1832	18869

$$\frac{18869}{1832} = \frac{44.08}{X}$$

$X = 4.28$ = Sugar % Bagasse III as recorded.

Juice from Third mill—

The quantity of this juice is equal to the quantity of Bag. II., plus the maceration-water, minus the quantity of Bag. III.:

$$24500 + 14130 - 22740 = 15890 \text{ lbs.}$$

As will be seen from the above, this juice consists of 57% of juice, as in Bag. III., and 43% of water.

$$\text{Juice in Bag. III contains } \frac{4.28 \times 100}{44.08 + 4.28} = 8.85\% \text{ of Sugar.}$$

$$\text{Juice from III Mill contains } \frac{8.85 \times 57}{100} = 5.05\% \text{ of Sugar.}$$

(The percentage of sugar actually found in III. juice is but slightly higher, viz., 5.27%.)

Bagasse I.—

As we know the sugar and water content of bagasse II. (7.48 and 44.17 %), and the water content of bagasse I. (52.61%), we find the percentage of sugar in bagasse I. to be:

$$\frac{7.48 \times 52.61}{44.17} = 8.91$$

With dry-grinding the juice in Bag. I. must be of the same composition as that in Bag. II, if the cane-juice be regarded as homogeneous.

If the mechanical condition of Bag. I. were equal to that of

Bag. II., the following would give us the sugar-content of Bag. II. obtained from Bag. I., macerated with the juice from III. Mill.

Equation II.—

	Sugar lbs.	Water lbs.
In Bagasse I (31930 lbs.)	2844	16800
In 57% of III Juice (9057 lbs.)	457	8600
	330	25400

$$\frac{25400}{3301} = \frac{44.17}{X}$$

$$X = \frac{3301 \times 44.17}{25400} = 5.74 = \text{Sugar \% Bagasse II.}$$

The figure thus found is, however, too low, as Bag. I. is always coarser than Bag. II., and the sugar in the former therefore less accessible to the maceration-liquid. The diffusive energy, expressed by the Quotient of Diffusion, of the latter would consequently be less than 57%. For these calculations the diffusive or penetrative action of the maceration-liquid on Bag. I. is taken at two-thirds of that on Bag. II. Its Quotient of Diffusion would in this case be 38. Equation II. has to be modified accordingly:

Equation III.—

	Sugar lbs.	Water lbs.
In Bagasse I (31930 lbs.)	2844	16800
In 38% of III Juice (6038 lbs.)	305	5733
	3149	22533

$$\frac{22533}{3149} = \frac{44.17}{X}$$

$$X = \frac{3194 \times 44.17}{22533} = \underline{6.17} = \text{Sugar \% Bagasse II.}$$

instead of 7.48%, the result obtained with dry-grinding.

The composition of Bag. II is now as follows:

	Sugar.		Water.	
24500 lbs.	6.17%.	1512 lbs.	44.17%.	10822 lbs.

These data substituted in Equation I.:

	Sugar lbs.	Water lbs.
In Bagasse II	1512	10822
Diffusion-water	——	8047
	1512	188869

$$\frac{18869}{1512} = \frac{44.08}{X}$$

$$X = \frac{1512 \times 44.08}{18869} = \underline{3.53} = \text{Sugar \% Bagasse III.}$$

Instead of 4.28%.

The juice from the third mill is under this modified treatment lower than what it has been shown to be under the usual treatment. This has to be taken into consideration.

$$\text{Juice in Bag. III contains } \frac{3.53 \times 100}{44.08 + 3.53} = 7.42\% \text{ of Sugar.}$$

$$\text{Juice from III mill contains } \frac{7.42 \times 57}{100} = 4.23\% \text{ of Sugar.}$$

Equation III. modified accordingly:

	Sugar lbs.	Water lbs.
In Bagasse I (31930 lbs.)	2844	16800
In 38% of III Juice (6038 lbs.)	255	5783
	3099	22583

$$\frac{22583}{3099} = \frac{44.17}{X}$$

$$X = \frac{3099 \times 44.17}{22583} = \underline{6.07} \text{ Sugar \% Bagasse II.}$$

	Sugar lbs.	Water lbs.
In Bagasse II (24500 lbs.)	1487	10822
Diffusion-water	——	8047
	1487	18869

$$\frac{18869}{1487} = \frac{44.08}{X}$$

$$X = \frac{1487 \times 44\,08}{18869} = \underline{\underline{3.48}} = \text{Sugar \% Bagasse III.}$$

Instead of 4.28, as obtained when the juice from the III. Mill is evaporated without having been further utilized for maceration.

EXTRACTION PER CENT. SUCROSE IN CANE.

While macerating with juice from III. Mill....95.35%
While not macerating with juice from III. Mill..94.17%

To obtain the same result by the ordinary mode of maceration in general use, it would have required at least 21723 lbs of water, equal to a dilution of 22.1%, as shown by the following:

$$\text{Diffusion-water} = \frac{(1832 \times 44.08) - (3.48 \times 10822)}{3.48} = 12382 \text{ lbs.}$$

$$\text{Maceration-water} = \frac{12382 \times 100}{57} = 21723 \text{ lbs.}$$

$$\text{Dilution} = \frac{21723 \times 100}{98125} = 22.1\%$$

In practice, a larger amount of water would have been necessary, as the Quotient of Diffusuion decreases with the increase of dilution. By applying the whole or part of the maceration-water on the first mill, a larger quantity still would have been required on account of the lower quotient of diffusion of that part of the water which is used on bagasse I.

In utilizing the III. Juice for maceration, we have increased the diffusive activity of the maceration-water from 57% to 87.8%:

$$\frac{12382 \times 100}{14130} = 87.8$$

On the strength of the foregoing deductions, arrangements were made at this mill to put the process in operation.

Results of one week's work are so available:

Two series of samples of the bagasse from second and third mill were taken daily and sucrose and moisture determined.

I. While the third juice was pumped back on bagasse I.

II. While the supply of third juice was interrupted.

A direct comparison being thus afforded between the results actually obtained and those which would have been given by the old method of maceration.

Juices.			I. Mill.	II. Mill.	III. Mill.
Density Brix°			19.97	11.36	5.01
Purity			95.9	91.8	89.4
Sucrose in Cane:			16.464%		
Dilution % Mill-juice:			13.1		
				I.	II.
Bagasse II.	Sucrose	%		6.23	7.40
	Moisture	%		44.45	43.78
Bagasse III.	Sucrose	%		3.67	4.48
	Moisture	%		43.50	42.65
Extraction % Sucrose in Cane.	At I Mill			81.86	81.36
	At II Mill			9.26	7.42
	At III Mill			4.15	4.89
	Total			95.04	93.94

Thus the results obtained by practical experiment are even more favorable than those found by calculation. If we apply this calculation to the figures in column II., we find that the sugar in Bag. II. would be reduced to 6.45%, and in Bag. III. to 3.90%. This indicates that the Quotient of diffusion of the third juice on Bag. I. is only slightly lower than that of the water on Bag. II. To bring about the result recorded for this week's work, the former quotient had to be five-sixths of the latter. In Equation III. it was assumed to be two-thirds, so that it will be quite safe to take this latter relation as representing the lowest limit of the quotient of diffusion.

The possibility of using the maceration-water to better advantage has been recognized before this. Mr. S. Faron, engineer of the Hawaiian Agricultural Co., applied in June, 1890, for a patent which, I understand, was to cover the above or a similar process. The patent was, however, not issued, and we are not in possession of any information as to whether the process was actually adopted by his or any other company.

E. Hartmann,

Laboratory of the Onomea Sugar Co., July, 1897.

ENGLISH COMMENT ON THE ANNEXATION OF HAWAII.

According to rumors, which are growing in volume and precision, says the Times, the Government of the United States has under serious consideration a project for the annexation of Hawaii. It is even said that a treaty providing for such annexation is in a forward state of preparation, and will be sent to the Senate at an early date. Mr. McKinley is stated to be strongly in favor of this course and to have interested himself very greatly in the settlement of details, while the annexation party is confident of a majority in the Foreign Relations Committee. On the other hand, our New York correspondent informs us that there is a strong party of objectors to any such change as is suggested in the relations between the United States and Hawaii. They point out that the existing arrangements give the United States a paramount influence in Hawaii, yet without involving any direct responsibility or raising any embarrassing questions. Were there any danger of Hawaii being annexed by any other Power, it is admitted that the United States might properly resort to vigorous measures in order to counteract such a scheme. But there is not the remotest danger of anything of the kind, consequently, it is argued, there is no need to involve the country in the difficulties connected with a totally new departure in American politics. Public opinion would seem to be a little languid on this subject. Annexation does not excite enthusiasm, but, on the other hand, enthusiasm would probably be developed were the nation once fairly committed to an enterprise, which, though regarded as a little risky, is not without points that appeal to the imagination of the American public. The question appears, in fact, to be one of those which can be to a large extent decided by the Administration of the day, and if the President has taken it up as warmly as seems to be believed in Washington, the chances are that the project will be carried out. It has been opportunely discovered that the reciprocity treaty is far too favorable to Hawaii, and that it puts nine million dollars per annum into the pockets of the Hawaiian Sugar Trust. This proved so perplexing to the Republican Senatorial caucus the other day, that after a two hours' discussion it was quite unable to decide whether the

treaty should be continued or cancelled. If the knot be cut by annexation, it seems probable that there will be troublesome questions to settle between one set of American sugar growers and another.

This is not by any means a new question in America. It will be remembered that early in 1893 there was a revolution in Hawaii, quite a bloodless one fortunately, but still a revolution. Queen Liliuokalani conceived the idea of having a little revolution on her own account. She produced a new constitution increasing her Royal prerogatives, and curtailing the influence of the white settlers, who apparently had a practical monopoly of political power. Her ministers, who bore names less mellifluous but more familiar to Anglo-Saxon lips than her own, flatly refused to have anything to do with her new constitution, whereupon she threatened to address the populace on the subject. They then got up a counter revolution, of course in the character of the maintainers of constitutional right against Monarchial encroachment. A Provisional Government was formed, the Queen was promptly though gently deposed, and the Monarchy was superseded by a Republic. President Harrison was at that time approaching the end of his term of office, and, although there was much talk of annexation, as well as discussion of practical measures in the Senate, he did not feel justified in committing the country to a novel policy. He was succeeded by President Cleveland, who, very soon after his inauguration, sent a Message to Congress withdrawing the annexation scheme altogether. Public opinion, then as now, seemed ready to be guided by the Administration. There had been no stronger public feeling in favor of President Harrison's policy, and there was none to speak of against President Cleveland's withdrawal. The matter quietly dropped, to be taken up after another Presidential election. The immediate cause on this occasion is the exhibition on the part of the Japanese Government of a disposition to bestir itself on behalf of the large number of Japanese engaged in the sugar industry of Hawaii. Apart from this, the situation does not seem to have changed appreciably during the last four years, though it may be noted that, whereas in President Harrison's time opinion was divided between a protectorate and downright

annexation, no one is now found to advocate a middle course between annexing Hawaii and leaving things as they are.

Hawaii is by no means in the position of a newly-discovered continent open to the first comer. On the contrary, its independence was recognized as long ago as 1843 by Great Britain, France, Belgium and the United States. So far as we are aware this recognition is still in force, and must therefore constitute a diplomatic difficulty in the way of annexation. No one, perhaps, pays much attention to the theoretical claims of the natives and half-castes who presumably form the bulk of the Hawaiian population, but whose aptitude for government is of the smallest. The civilized interests of the islands are, however, by no means exclusively American. On the contrary, there are English, French, German, Japanese, and even Chinese interests which are of considerable importance, and probably in some cases of even greater importance than those of American citizens. So much is this the case that four years ago there was some question of a joint administration of Hawaii, which might have found more favor but for the very poor results obtained by such a system in Samoa. Probably the objections to annexation that weigh most with thoughtful Americans are of a more purely self-regarding kind.

There is no machinery in the American Constitution that seems very well adopted to secure the effective administration of islands some thousands of miles away. Hawaii can hardly be made into a State, however energetic may be its American citizens; while the difficulties in the way of treating it as a Territory are only a few degrees less serious. In whatever way annexation might be effected, it would seem to entail novel responsibilities, and to introduce an entirely new element into the American political system.—London Sugar.

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THE AMERICAN BANANA TRADE.

One curious result of the Cuban war is the complete revolution of the banana industry. Three years ago one could feel reasonably certain that a banana seen in the United States was grown in Cuba. Now we do not get a single bunch from the island. Cuba formerly sent us over 2,000,000 bunches of the rich tropi-

cal fruit every season, The principal firms engaged in the importation of bananas had great plantations of thousands of acres in extent, and eastern Cuba was rapidly becoming one huge banana farm. In fact, the raising of bananas had grown to be one of Cuba's most important industries. Twenty vessels were continually occupied in carrying the fruit to the United States. During 1895 the crop was not seriously affected, but last year banana traders found it impossible to load their vessels in Cuba. During the season a large part of the plantations was destroyed, and now nothing grows where once was the most fertile and highly productive spot in Cuba.

The destruction of the banana plantations has incidentally involved the loss of considerable American capital, but the trade itself has not been allowed to languish, although it is almost true that not a banana comes out of Cuba today. The amount of this fruit used in America this season will be more than double what it was in the year before the Cuban war. Cuba, the great banana raiser, has disappeared from this line of work, but her place has been taken by Jamaica, Porto Rico and the surrounding islands, Mexico and Central America. Natives, blacks and American planters have gone into the business in all these places, and the result is that bananas are now cheaper than ever, and the supply is large enough to meet the rapid increase in demand. This increase has been very remarkable during the past few seasons. It is probable that this year between 15,000,000 and 20,000,000 bunches will be brought into this country. Of this amount, nearly one-half comes by way of New Orleans, one-third by New York, and the remainder through other ports.

It is only within the past few years that the handling of bananas has been worthy the name of a distinct trade. Previously it was only a part of the fruit trade, and, like most kinds of fruit, the banana was counted on as good for its season. The banana season was "on" when apples, berries and other native fruits were "off." As time went on, however, and greater familiarity with the banana taught people that it was one of the most excellent and adaptable of fruits, a steady demand grew up which exists the year around. Physicians took up the banana and recommended it for its healthful and nourishing qualities, and altogether the banana has come into high favor. That is briefly why

the people of the United States will eat this year some 20,000,000 bunches of bananas, or roughly one bunch averaging 200 bananas to every family in the country. Aside from its commercial importance, the banana trade is interesting for its picturesque feature. From the dark-hued Jamaican or Mexican who cuts the stalks where they grow, through the colored roustabouts and white handlers who load and unload the vessels, the wholesale and retail dealers, to the Greek and Italian push-cart merchants who sell the fruit upon our city streets, there is a range of thrift and shiftlessness, and a variety of humankind that it would be hard to match in any other industry.

The boats engaged in the banana trade are properly coasting vessels, light of draft, to accommodate the shallow harbors of the tropics, built for fair speed and great carrying capacity. Most of them belong to the different firms that import the fruit, and carry from 20,000 to 30,000 bunches at each trip. This means from 2,000,000 to 4,000,000 bananas in every cargo. The perishable nature of their load requires quick work in loading and unloading these boats, and there is no more lively or interesting scene than a banana vessel taking on or discharging cargo.

At the little West Indian ports where the bananas are loaded there is apt to be the greatest excitement during the day or two while the vessel is taking on its cargo. Carts of the most wonderful construction come pouring in from the plantations, piled high with the green fruit, fresh cut. These carts are hauled by bony cattle or sullen mules, and are driven by lazy blacks, who look upon their loads and swear lustily at their teams and at each other in the musical tones of these southern islands. The air is full of the cracking of whips, rich Spanish oaths and an occasional invigorating Anglo-Saxon injunction to "look lively there."

Every Banana is Counted.

As the heavy bunches of fruit go over the ship's side they are counted and packed away in the hold in lots of sevens, eights or nines, according to the number of "hands," that is, the number of rows of fruit on each stalk. When the season is at its height, as it is just now, there is a grand rush to get the fruit on board, and the work never subsides until the vessel is filled to the

hatches. Sometimes, however, the boats have to coast along the shallow shores to make up their loads, and then the fruit is rafted out to them in small lots on log rafts bound together with vines and poled by strapping blacks, whose ideas in regard to clothing are about as primitive as those of the natives of Central Africa.

When the hold is filled, the banana boat wastes not a moment in getting away with her cargo, and makes the best time she is capable of to her port of destination. Most of these boats are very fair travelers, and can unload the fruit in New York within six days of its cutting, making the trip from Jamaica or Porto Rico to New York in three or four days.

When the boat arrives in port, gangs of workmen are awaiting to unload her. As soon as she has tied up to her dock she is surrounded by trucks and lighters, the hatches are thrown open, and the men fairly swarm over the ship's sides and into her hold. If the boat is a large one, four or five "gangs," from 100 to 125 men, work on her at once. There is sometimes considerable rivalry between these gangs, and they often make the bananas fairly fly out of the ship's hold in the effort to handle more bunches within a certain length of time than any of their rivals. All the work is done by hand. A double line of men extends from the hold up through each hatchway and out to the side of the boat, where the big, cool-looking green bunches are passed into trucks or lighters or cars.

As each string of fruit comes on deck, swung by the ends of the stalks between the double line of handlers, it is classed, counted and diverted to the particular lot to which it belongs, all while it is in motion. Beside the rail sit the counters, who operate little automatic machines, registering the number of bunches put into each load. In each gang there is a crier, who shouts out the number of each lot as it goes over the side, and a "boss," whose principal duty seems to be to "keep things moving." A member of the firm sits on the slippery deck and superintends the general work, while the different buyers stand beside him, watching the fruit as it comes up, and offering suggestions as to its quality or the particular kind they want. About them is a perfect babel of noise, the constant tink-ling of the registering machines, the monotonous "one, two, three, four" of the counters, the sharp-spoken directions of the superintendent as he says "one hundred

greens, seven, out," the encouraging shouts of the bosses as they urge their men to "let them come; send them up lively, now," the cries of the truckmen, quarreling for places, is all merged in a sort of composite clamor, from which the bystander can make out nothing at all.

The great bulk of bananas brought into this country are the yellow kind, but a good many of the red variety from Lower California and Central America are also used. There is no other kind of fruit that can be served in so many different ways or on so many occasions as the banana, and this in great measure accounts for its growth in popularity and the great increase in its use.—Washington Star.

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HISTORIC DATA CONCERNING THE AMERICAN BEET SUGAR INDUSTRY

So much attention is now being given to beet sugar, both in the press and in current conversation, and so little accurate history of the industry's earlier days is apparently known, that it seems advisable to briefly indicate the main points in its history—not in the world, but in America, and that means California, as this State is the mother of the business.

California to-day—and has always—lead America in the production of beet sugar; not only was the first successful attempt made in this State, but it was made within 25 miles of San Francisco, at the modest little town of Alvarado, Alameda county, a town so small and so quiet that it was never heard of by nine-tenths of our people, and which is nevertheless better know in France and Germany, and to the authorities of the United States Department of Agriculture, than to the inhabitants of the San Joaquin Valley. France and Germany especially know it, because it marked the beginning of what eventually will be a most formidable competition in their best market; these two countries, instead of exporting into the United States each year a total of 9,230,068 dollars (1896) worth of sugar, will have the doubtful pleasure of seeing us make all our own. And Alvarado, Alameda county, is the little town now of world-wide fame which marked the first commercial success of making beet sugar in America.

The hurried newspaper reader of today thinks Watsonville, in Santa Cruz county, entitled to this honor. That impression would disappear if he could refer to the official bulletins of the United States Department of Agriculture or to the various new articles in the sugar journals, such as the Louisiana Planter, Sugar Beet, or any of the numerous German, French, or English periodicals which make a speciality of sugar news. Alvarado it was, then, which first showed that beet sugar could be made at a profit on American soil; her success pointed the way for the Watsonville factory afterwards erected by Mr. Spreckels, who has continued his good work by putting up the magnificent plant at Salinas, now in course of construction. But Watsonville was only a follower; her founders had pooh-poohed at the Alvarado factory, and that beet sugar could not be profitably made in California; that was when sugar was from 12 to 14 cents a pound; later the opposition sugar refinery under Telegraph Hill was started, and a sugar war came on. In spite of the resulting low prices, the old Alvarado plan worked on, and thus demonstrated how cheaply sugar could be made. The projector of the Watsonville factory took his cue from Alvarado; the Alvarado people, handicappped as they were by old machinery, finally succumbed, owing to a disastrous boiler explosion, which ruined their plant—temporarily, however, it proved; they reorganized their company, put in some new machinery, built a new building, and started in again with the dogged perseverance which had come from a sad experience of 17 years, and succeeded so well that today, ten years later, the old house is being remodelled and increased to more than double capacity.

The earliest attempts at beet sugar in this State were, to summarize, made at Alvarado, under the auspices of E. H. Dyer, in 1869. In 1873, this factory, in opposition to Mr. Dyer's ideas was moved to Soquel, Santa Cruz county; it failed completely. About the same time a factory was put up at Sacramento, and another at Isleton; they both failed. Then there was a period of six years or so, during which Mr. E. H. Dyer was striving to organize anew for a repeated trial at Alvarado. Success came to him in 1879, and he organized what proved to be the "first successful American beet sugar factory." It ran with varying success for eight or nine years; during its second campaign it

earned a profit of 33 1-3 per cent.; it was rebuilt and enlarged in 1887, and is today again being enlarged. The Dyers conducted the enlarged plant for two years or so, when their place was taken by Mr. E. C. Burr, formerly of the American Sugar Refinery. Under his business management, and under the technical direction of Mr. J. W. Atkinson, also of the American Refinery and formerly an instructor in chemistry at Berkeley, the renewed factory has had great success.

About the same time that the 1887 factory was put up at Alvarado, Mr. Claus Spreckels started his Watsonville plant, which, after several years of hard luck and discouraging results, finally settled down on a profitable basis; since that time it has given most profitable results— so profitable that it has already encouraged its owners to start the Salinas factory already mentioned.

Also about 1887-88, the Oxnards, sons of the famous cane sugar refiner, erected the Grand Island factory in Nebraska; in 1890-91 they built the plant at Norfolk, Nebraska, and the great factory on the Gird ranch at Chino, California. In the same year the Dyers, of Alvarado, designed and had made in American machine shops the machinery for the magnificent factory at Lehi, Utah. It is a pleasing fact to contemplate that this family was not only the pioneer in our American beet sugar industry, but that, not content with inaugurating a new industry, they must proceed to build their own machinery. Consequently they now enjoy the unique pleasure of being at once pioneers in manufacturing beet sugar and pioneers in manufacturing beet sugar machinery.

Their machinery has been put to most severe tests and has come out with flying colors; it not only has greater capacity, but it does its work better and cheaper. Consequently, today our American sugar industry is independent of European machine shops; we can build our own, can run the factories with our own men, and turn out sugar equal to any.

After the erection of the Nebraska and Utah factories there was a lull, owing to the panic of 1893, and, latter, to the policy of the Wilson bill. Consequently no new factories were erected. Last year, however, a factory was in operation at Eddy, New Mexico.

There is also being erected, in addition to the magnificent Salinas enterprise of Mr. Spreckels, another American-built factory, the Los Alamitos Sugar Company's works, near Anaheim, California. These are being constructed for W. A. Clark (the well-known mining man of Butte), by E. H. Dyer & Co., of Alvarado, California, and Cleveland, Ohio.

In addition to the above actual projects, there are a large number of indefinite propositions, many of which will be undoubtedly realized if the new tariff is speedily settled. There is today, outside of mining, perhaps, no business in America which will return such large and steady profits. We import each year a hundred million dollars worth of sugar; we can make it all at home, and it will not be long before we do so.—A Sugarman, in California Advocate.

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HAVEMEYER'S BOYHOOD.

Our experience is that poor boys do better than the sons of well-to-do men; they appreciate their situation and a slight raise in wages better. Such was the remark of a well-known grocery jobber, one of the many who have worked their way from office boy to a partnership. It is often the case that boys trained in the public schools, accustomed to scanty fare and a home with the bare necessities of life, frequently distance those educated at a private school and who live luxuriously and enjoy the best social advantages. The latter lack that appreciation of the necessity of hard work and faithful service as a means of promotion that the poor boy entertains. This is not so much the fault of the well-to-do lad as it is to the wrong sort of training. Their parents seek to save their boys from hard labor or the menial work which they did when making a start in life, and therefore do not properly estimate the value of work nor pay that strict attention to details which is necessary to success in life.

Rich men's boys that have been well educated and correctly trained, we believe, stand a better chance in the race of life than the poor boy with ordinary advantages and well trained. We have an instance of this from the life of the late Theodore A. Havemeyer, whose father was many times a millionaire and whose family connections were with the oldest and best families

in New York. Mr. Havemeyer often told, with pardonable pride, the story of his boyhood life. In alluding to the early training of himself and brother Henry, he said:

"We were taught our business thoroughly. After leaving school I was sent to Europe to learn all I could concerning the business I was to follow for a livelihood. On my return, in 1859, I went into my uncle's refinery in Vanderveer street, and from there I went into the business in Williamsburg. I made up my mind from the start that whatever was worth doing at all was worth doing well. For twenty-five years I was at work at 7 a. m., and did not leave the refinery until 5 p. m. I never went to bed at night until I had gone through the whole establishment. Many times I worked all the night long. While I was a single man my expenses never exceeded $50 a month. Pilot bread and cheese made for me many a meal. A canvas suit was my daily apparel, and there was no part of the business at which I and my brothers did not work; no part we considered too dirty or too arduous or beneath us. One prerequisite in any business is a thorough mastery of its principles and a knowledge of all its details. There was no part of the manufactory or of the refining business with which we were not thoroughly familiar. I knew how to fire up under the boilers; how to run the engines. I built an engine once myself. I knew how to refine sugar, and how to market it. I knew what was a fair day's work for a man, because I worked alongside of the men. Another requisite is application and alertness. We were always on the lookout for some better way to do a thing, and our success is largely owing to inventions brought out by observation and experiment. Another need is integrity and promptness in business dealings. We always paid cash as we went along, but, if one has to give notes, they should be promptly met. We filled our orders always according to agreement. Another rule is to keep away from liquor, and we always followed it. The practice of these rules, combined with frugality and ordinary faculties of mind, will bring commercial success to any man."

How much truth is contained in the above simple outline of a start in life. The boy that is afraid of continuous hard work, and who tires of detail, will never make much of a place for himself. One of the hardest-working men in one of the largest firms

in this city won a partnership because he put his whole soul into the business. When he began with the firm he was told to be on hand at 8 a. m. Later the senior partner asked if it would inconvenience him to be at the store at 7 a. m., and look after a particular branch of the business. Quickly and interestedly he replied, "Not at all." And he was faithful to the new trust. Again he was asked if he could just as well get down at 6 a. m., and once more with cheerful manner said that he would. And he did; and not only that—he did his level best at every point and demonstrated that he loved work, was not afraid of details, and could be relied upon at any place in the great business. Boys of that stamp are sure to win a partnership, whether the sons of poor or rich men. Successful business men owe it to their sons to give them the right sort of training; to teach them to honor toil and to know the value of details and dollars.—Am. Grocer.

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BEETS AND BEET SUGAR IN UTAH.

The Rural World writes as follows: The Utah Beet Sugar Co. of Lehi, Utah, produces 4,000 tons of sugar a year. The growing of the beets and the making of the sugar gives employment to over 1,000 persons. The home demand is sufficient to keep five more such factories in operation. The sugar content is from 12 to 15 per cent. and the yield per acre from 15 to 18 tons. The beets sell from $3.50 to $4.50 per ton, depending upon quality. Winter moisture is sufficient to germinate the seed, and no irrigation is required until the plants are seven weeks old. Three irrigations, by the furrow system, are generally given during the season. When the plants get above the ground men and boys begin cultivating and weeding. A crooked iron weeder, fastened to the hand like a corn husker, does the best work, and the weeder gets upon his knees as in onion culture. The small farmers, by the most intensive culture, reap from ten acres what the average big farmer does from fifty acres. There are fewer weeds in the beet fields than in any other Utah crop, and the land is thereby benefitted. Beets do not impoverish the soil as much as other crops, and by absorbing much of the alkali found in western irrigated lands, benefit it somewhat, still fertilizers im-

prove the yield very materially. The Utah sugar factory requires $27,000 worth of coal and coke every year. Limestone, cotton cloth and other materials, costing $25,000 per year and produced in Utah, are used in the making and marketing of this product. One of the largest cattle feeding yards in the State is operated in connection with the factory. The pulp from 40,000 tons of beets is put in large silos, and fed to stock and hogs. It would be almost impossible to enumerate the many advantages obtained by farmers in the vicinity of a beet factory. Labor for thousands of persons, home market for products, plenty of cash, intensive and beneficial cultivation making an era of small farms, and peace and prosperity, may be enumerated as some of the blessings from the production of the sugar beet.

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DIRECT MANUFACTURE OF WHITE AND LUMP SUGAR.

In past issues of this journal we have had occasion to refer to the several processes for the manufacture of white and lump sugar, which may be placed on the market and compete with many existing grades of refined sugar, and thus save the various manipulations of which the refining processes consist. The Steffen and Druker method has many advocates. By it the juices from the second carbonatation are submitted to the action of sulphurous acid until they give an acid reaction. They are then cooled to 86 deg. F. and combined with bone black, which had previously absorbed a certain percentage of sulphurous acid. The bone black is subsequently separated from the juice by filtration. The juices from presses still retain 2.5 grams to 3 grams of sulphurous acid per liter (0.087 to 0.10 oz. per 0.90 qt.); this is run into a wooden vat containing sufficient milk of lime to saturate the acid in excess. The masse cuite from the concentrated liquor thus obtained is very fluid and colorless, and is run into special centrifugals in which blocks of white sugar are obtained. The first syrups from centrifugals may be used to produce directly a superior grade of granulated white sugar.

Another process, also based upon a preliminary saturation with sulphurous acid, consists in producing an agglomerated lump sugar. The sugar used for this purpose is granulated, under

which process the existing crystals, of which the mass consists, are considerably modified, and the product obtained dissolves more readily than would a crystalized sugar direct from the centrifugal. The crystals from the granulator, being more or less broken, are run over bolting cloths and the powder obtained is thus separated and is consequently added in certain proportions to the granulated sugar. The sprinkling with water gives sufficient moisture for adherence of the various particles of the mass when in a machine known as an agglomerator. The cakes or blocks obtained are then dried in special ovens and subsequently broken in lumps. This sugar is of a satisfactory taste, but may always be recognized by the manner that it dissolves in water. That portion which has furnished the cohesive force is the first to dissolve, and the irregular crystals are left to themselves, which, in turn, also gradually melt.—Sugar Beet.

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PROFIT SHARING.

[From the Coonoor (India) Planting Opinion.]

Each year the labor question seems to develop new difficulties in the planting districts of India and Ceylon. Any attempt to solve, or even partially solve the great problem, is worth attention. Yet we fear the very novelty of the subject of this article, *i. e.*, how to devise a method of rendering the interests of plantation laborers identical with that of their employers, will arrest less serious attention than it undoubtedly deserves. It is a very old and sound text our remarks are based on: if you want a man to take a real interest in your business, make him a part of the concern: there is no interest greater than self-interest.

Profit sharing has been attempted on some Straits Settlements estates, and with, we understand, excellent results. There is no obvious reason why something in the same line should not be attempted in India. We have but sketched the roughest of outlines of the scheme, it needs careful thought and experiment to put in on a practical working basis.

In the March number of the Hawaiian Planters' Monthly, the organ of the "Hawaiian Sugar Planters' Association," appears a very interesting article on the above subject by the Hon. Mr. P. C. Jones.

Mr. Jones discusses the labor question very thoroughly and shows not only what is being done abroad in establishing mutual co-operation in large enterprises, but the advantages of introducing the system in the Hawaiian Isalnds, and thereby providing a more intelligent and permanent population.

Various methods have been tried at various times in farming, mining and manufacturing, by which the laborers have to a greater or lesser extent participated in the profits of the business. There are objections to this in agriculture, as it does not encourage the farmer to make improvements: time wages, piece work, and quality prizes, percentages on sales, etc., have all been tried with more or less success but do not quite touch the subject.

Mr. Jones quotes two letters from sugar planters showing how the system has worked on the estates in their charge. The first letter is from Mr. W. W. Goodale, of the Onomea Sugar Co., Papaikou, Hawaii, who purchases his cane from his men by its estimated weight. The second letter is from Mr. Wm. Kinney, late Manager of the Honomu Sugar Co.

Mr. Goodale, on behalf of his firm, gave out contracts to one of his men thus: The planter (as the cultivator—Chinese, Japanese, or what his nationality might be, is called) was paid a stated sum per acre for the plot he cultivated, with a proviso for a bonus on the yield if it exceeded 4 tons cane per acre, and a forfeit if the yield fell below the four tons per acre. The result was in a way satisfactory. The yield was in excess and a bonus was paid the planter by the Company.

Mr. Goodale mentions another contract made with a Japanese gang, by which he paid a stated sum per ton of cane delivered alongside the flumes. The result was altogether satisfactory, as the men made from $3—$10 per month more than they could have made by plantation work (time wages). The cane was as cheap and the fields were as well kept.

Mr. Kinney works somewhat differently. On his Company's land, the planters are usually paid so much per clarifier of juice. A clarifier of juice is 500 gallons without maceration water, that is, $8.40 per ton of sugar or 90 cents per ton of cane. This is for cultivation only. The company has nothing to do with cleaning the ground, procuring seed, planting or harvesting. The price the Company pays is 3 to 6 dollars per clarifier.

There are other contracts—covering, planting and harvesting, and still others that cover everything from felling forest to delivery of cane alongside flume. Acreage of a gang of planters generally varies from 30—80 acres. Earnings per man are rather more than day wages. When a field is to be given out there is usually competition, which shows they like this way of working.

On the whole Mr. Kinney finds his system of work pay. Yet it is not the system which could be brought into operation with tea; for though doubtless we could get the leaf to the factory in good condition and yet keep the estate properly plucked and worked if we gave the various fields out on contract, yet we should have the leaf coming in very irregularly, some times in driblets, sometimes with a rush, and tea leaf cannot wait like cane, without very rapidly spoiling.

Yet there is a way by which all might participate in the profits and which would, I fancy, do much to attract a good class of labor. Of course it would take some time to make them understand the principle of the thing, but I think that as soon as Ramaswamy and Karapie found that if they worked well and steadily all the year round they would, if the estate paid, receive a santosum, they would work better and more intelligently than they often do at present. Now they have no incentive to work better than the usual average, and for this reason, "the master," they say, "is contented with so much work per diem; if any one of us goes and does better, he'll keep us up to the higher standard of work; good for him, but bad for us." Now if they understood that their best work meant not only rupees in the master's pocket but a proportion of pies in their's. I think it would be a great incentive to them to do their best.

On an estate managed by the proprietor, I would suggest that at the end of the year 5% on the profits as well. For example: addition to their wages. No coolie who had worked less than 20 days per month or been on the estate less than 6 months should get any bonus. Those that had worked over 20 days a month, and had been on the estate for over 6 months, and the writer, should be paid shares out of the bonus in proportion to the total of their wages.

If the estate is not managed by the proprietor but by a manager he should be paid 5% on the profits as well. For example: Utopia estate pays well and the proprietor lives at home, but the

paying condition of the estate is largely due to the excellent and hard working labor he has collected on the place. He would never have got such a manager and such coolies had he not treated them liberally and allowed them to share his prosperity. This he does by setting aside 10% per annum to be divided amongst his manager and the coolies. No coolies are entitled to a share till they have been a year on the place, and to gain the bonus they must work at least 200 days per annum or more.

If the coolies' 5% was divided amongst all the coolies, each would get a trifling sum; taking the best only, they get a substantial bonus; it should be a powerful inducement to do good work.

To sum up. We would advise the prevailing system of wages and kanaks to remain absolutely unaltered at least until such time as the labor force has thoroughly recognized the advantages accruing to them from the new departure. Once this understanding is established, the apparent direct loss of a small fixed proportion of the profits will be indirectly recouped in many ways. First and foremost will be the permanency of the labor force, resulting in itself in the work being done by trained and experienced coolies. Secondly, the work will be far more thoroughly done, as every hand on the estate will have a direct personal interest in the results of his or her own work. We have confined ourselves strictly to the business aspect of the question, and we disclaim being actuated by any philanthropic motives whatever. Yet sentiment being, even in business, a factor of no mean importance, the humanitarian side of the problem should appeal to no small section of our readers.

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INFLUENCE OF BEES ON CROPS.

[Agricultural Gazette, N. S. W.]

There are tiny agents employed by nature that dwarf into utter insignificance all the modern implements of husbandary that are in use to ensure "an abundant and heavy harvest." They are seldom taken into account. These tiny agents are an absolute and concomitant necessity for the production of a crop from any member of the vegetable kingdom. The wind and insects are the agents employed for the fertilization of crops. The

two mentioned are the chief, but there are many others of a subordinate character that Nature frequently enlists to aid in the reproduction of the various members of her plant life.

Flowering plants, "the herb yielding seed and the fruit-tree yielding fruit after its kind, whose seed is in itself," are the portions of the subject I wish to deal with. How herbs yield seed, and how fruit trees yield fruit, appears strange, if we take into consideration the too frequent destruction of the very many agents, more especially the honey bee, that husbandmen in their blind ignorance are constantly waging war upon. "Smear the trees with poisoned honey," "Destroy the bees of the bee-farmer," or "Burn down the trees where there are bee nests," is the too constant advice given by well-educated fruit-growers, but whose knowledge of bee life is far below zero. Nature has been very lavishing in the distribution of her varieties of indispensable helpmates for the land culturists. The tiller of the soil, after the necessary preparation of the land and all the mechanical aids he brings to bear in assisting the earth to yield her increase, and to produce her crops of cereals, vegetables, and fruits for our imperative use, is solely dependent on outside agents, over one of which he has little or no control. I refer to the wind. In insect agency—of these the principal ones are members of the bee family—he can to a certain extent regulate the supply and demand.

The chief agent employed in the fertilization of the seed that supplies us with the "staff of life" is the wind. Seeds that are so fertilized are termed anemophilus. But life's luxuries—cherries, plums, and other drupes or stone fruit generally—are fertilized by insects; so are the pomes and all apple-like fruits, citrus fruits, berries, etc. Insects make the labors of the fruit-grower a greater certainty—make "assurance doubly sure." Without them all his labors would end in a wretched and miserable failure. We are entirely dependent on insects for the fertilization of our fruit. Seeds or fruits that are thus dependent on insects for reproduction are termed entomophilus. It is a true and wise saying, "No bees no fruit." Nothing can be more fallacious than the idea that bees injure crops. There is no more widely entertained opinion amongst fruit growers and florists than this. Let a fruit differ somewhat in form, tint, flavor, or

general appearance from that of the same crop on the same tree, the innocent bee is accredited with having "inoculated" that particular member of the fruit of that tree. I have heard it said, when examining the fruit on a navel orange tree, where the characteristic mark in some of the fruit was very prominent and in others almost inconspicuous, that the latter was caused by bees; and this, too, from men of prominent positions in the agricultural world. If an ornamental flowering plant produce a bloom differing somewhat from the rest of its kind, or sport, the bee is said to be the culprit.

Jam makers, during preserving seasons, very frequently when the bees come to clean up the waste syrup, and perhaps steal a little from that not found in the waste tub, cause by means of boiling water the destruction of millions of these tiny and industrious workers. Men do not understand that if they were to carry out this slaughter of the innocents with too high a hand, they would have little or no fruit to preserve. It may be interjected that butterflies, moths, beetles, and other members of the insect world fertilize our fruit crops as well as the bee family. True; but they leave behind them whole armies—well-drilled armies—of caterpillars, grubs, or maggots. These destroy the very fruit their parents fertilized, defoliate the trees, cause sickness inducing disease, and ultimately the destruction of the orchard. This cannot be said of the bee. Butterflies, etc., fly from tree to tree and orchard to orchard, laying a few eggs here and a few there. It is difficult to confine or introduce them to a district, and when once there, it is a greater difficulty still to exterminate them. Insect fertilizers, other than bees, are nearly all solitary and houseless wanderers, and it is a work of patience and labor to mitigate their ravages, and the little good they may do as fertilizers is greatly counterbalanced by the great mischief wrought by their offspring. On the other hand, bees are social, are domestic, are under control, can be increased or diminished according to requirements.

The advent of a bee-keeper in a fruit growing district is not a blessing in disguise, but a blessing so prominent that a traveller passing through a fruit district by express train during fruit harvest can always see the handiwork of the bee. The orchardist cultivates the trees from which the bees get their pollen and the

bee-keeper his honey harvest, and the fruit-grower in his turn is almost entirely dependent on the bee-keeper for this harvest of fruit. Between bee-keepers, fruit-growers, florists, etc., there is a Mutual Provident Association so strongly united that to repress the former is to destroy the profits of the latter.

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SUGAR UNDER THE DINGLEY TARIFF.

That which most concerns sugar producers now is the future of the market. The enormous importations of sugar brought into the country hurriedly because of this expected rise in the tariff rates will necessarily prevent the sugar refiners who are chief holders from coming into the market to buy our sugars excepting at such times as they may think it judicious, their own necessities for sugar supplies being reduced to nil for the time being. As the general basis on which to consider sugars is that of 96 test, which is very closely aligned with our own prime yellow clarified, we select it and find that under the new tariff schedule the duty is 1.62½ cents. The import values of the beet sugars not above 16 D. S. that came into the United States during the year ending May 31 was 1.87½ cents per pound. The average import value of the cane sugars not above 16 D. S., imported during the same time, was 2.15 cents per pound. From this we find that the duty paid upon these beet sugars during the year was ¾ of a cent per pound and on the cane sugars .86 of a cent per pound. It is true that the average test of all sugars imported is below 96, but for the sake of comparison we may use 96 test, which is now paying 1.68½, and contrasting this with the average duty paid during the year ending May 31, which would be .80½, we find that the duties would be increased 1.08 per pound.

Under the tariff commission law, which ended when the McKinley bill was adopted in 1890, it was found that the average test of sugars imported was 90. It has been reported since that time that the average test had advanced to 92 or 93. If for this analysis of the effectiveness of the coming duties we assume the average test of the sugars imported during the last year at the average duty of .80½ cents to be 92 test, these sugars under the present law would pay 1.54½ instead of .80½, indicating a rise in duty of .74.

If then, under the new tariff bill, the average duty on sugar has been increased $\frac{3}{4}$ of a cent per pound, we should naturally add the increase to the prices that prevailed last winter. As prime yellow clarified sold largely at $3\frac{3}{8}$ cents, an increase in the duty of $\frac{3}{4}$ of a cent per pound would seemingly give that grade a normal value of $4\frac{1}{8}$ cents. As against this, however, we have the enormous stock on hand, which will prevent the refineries from coming into the market for sugars excepting as they may find it advantageous. Should they remain out of the market the general level of sugar values throughout the world would almost certainly be considerably depressed, and to whatever extent this should occur we would be deprived of the advantages gained by the rates in the new tariff. On the other hand, it would seem fair to suppose that the holders of the enormous stock of duty-paid sugars now in this country would endeavor to realize as far as practical the profit that would come to them from the realization of this full increase in value represented by the increase in duty. Just where these opposing influences will meet in compromise, it is now very difficult to say. Prime yellow clarified sugars ought to sell in Louisiana next winter at 4 cents per pound any way, but the present prices of 96 test hardly indicate that we shall receive that price. As soon, however, as the new tariff gets fairly into operation and importations under it shall be made, we can then judge better of our prospective market.—Louisiana Planter.

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EDISON'S NEW WONDER—ORE-SEPARATING PROCESS.

Thomas A. Edison has just brought to a practical conclusion his great ore-separating process, at the mine at Edison, near Ogden, N. J., on which he has been at work for many years. After wrestling with and overcoming obstacles that would have conquered any less persistent experimenter, the process has at last been finished and the great plant is in running order.

The scheme is an interesting one, in that there is no human intervention during the entire process from start to finish. When the cars of ore and rock are dumped in large masses into the crushers that form the first step in the process, the rest of the pro-

cess is entirely automatic, the crushed rock and ore being carried automatically from one set of crushers to another by means of endless belts and bucket elevators, till the material is reduced to the requisite fineness, and then another series of belts and elevators carry it to the separating house, where the material falls in a fine stream across a field of large electro magnets, which divert the iron from the direct line of fall and drop it into one receptacle, while the refuse and rock fall into another.

This process is repeated a number of times, till at last the resultant product is pure magnetic oxide of iron.

Process Purely Automatic.—Automatic carriers take the iron ore thence to the bricking plant, where, by ingenious mechanism, over which the great inventor has spent thousands of dollars in experimentation, the ore is mixed with binding material and pressed into small bricks for convenience in handling. These are then baked and are ready for the market. The sole remaining work of construction yet to be done is the building of the rotary furnaces which shall bake the bricks as they are delivered and turn them out automatically. There are no mechanical or scientific difficulties connected with this part of the process, and these furnaces are to be built as soon as the frost is out of the ground in the Spring.

The Wizard Rejoices.—Mr. Edison is jubilant at the final success of his work. Just at present he is experimenting in the lines of electric lighting. He said a day or two ago that he had neglected a number of these matters while finishing up his work at the mine, and that during the next three months he should have some developments to bring out that would work a revolution in some of the processes of electric lighting.

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Yes, Mr. Bayard, free speech is a thing to fight for, but remember the rhyme you learned at school:

If you your lips
Would keep from slips,
  Five things observe with care:
Of whom you speak,
To whom you speak,
  And how, and when, and where.