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The latest quotation of sugar in New York was 4 3-16 cents for Cuban centrifugals 96° test. The stock of sugar in all countries—cane and beet sugars—was 2,711,590 tons, which is 277,000 tons less than it was at the same date, in 1897.

We are pleased to see that the Nilgiri Planters' Association has not lost its interest in the proposal to introduce the scale-eating beetles from Queensland. At a recent meeting, the association offered to bear half the cost of Mr. Newport's scheme for their introduction. Surely other Indian associations will follow.

In Havana, Cuba, where yellow fever is prevalent, mosquitos have been found, strangely enough, to act as a preventive medium. The method adopted is to inoculate fresh arrivals through the bites of mosquitos that have first contaminated themselves through biting diseased persons.

Chauncey M. Depew says: "I have learned from observation that three things happen to a man who works steadily without relaxation. In the first place, he becomes nervous, irritable and hard to get along with. In the second place, the grade of his work falls off, his services are worth less and he is liable to err in his judgment. In the third place he dies suddenly. It is an incontrovertible law of nature."

Out of the 395 sugar houses in operation, in Louisiana, 230 make sugar by the vacuum pan process, and 165 of them, generally the smaller ones, by the old open kettle process.

The 230 vacuum pan sugar houses of the State have averaged 1,200 short tons of sugar production each, while the open train houses average but 191 short tons each. The total production of the State, as estimated by Bouchereau for the year 1896-7, reaches 316,000 short tons of sugar.

In spite of the phenomenal depression in the prices of American coffee, a great deal of energy is being displayed by British syndicates in the exploration of Mexican coffee lands. A large London syndicate, named The Mexico Produce and Estates Syndicate has recently been formed, with offices at 138, Winchester House, London, E. C., who have deputed four experienced Ceylon planters to report on the capabilities of the country.

A plant at present found in great abundance in South Africa is likely, in the opinion of experts, to become an important article of commerce. This is "the bowstring hemp plant." With the aid of a machine, which has been recently invented, fibers have been prepared from its leaves, which have turned out to be the strongest fiber yet known. This strong quality of the fiber was first discovered by the scientific experts of the Challenger expedition, who used it to make their deep-sea lines.

Here is a receipt for driving ants away from coffee beds. It is sent to the Straits Times from Kuala Lumpur: Dig where the black ants are to be found, and sprinkle cold wood ashes as much as may be necessary. This will drive away the black ants, and will probably prevent the white ones from coming up. The ashes will not only drive black and white but even red ants, and can be used to keep these little parties away from almost every object dear to their tiny hearts.—N. B. Herald.

Experiments are being made with a system of compression of flour into bricks by hydraulic pressure. The trials show that flour so treated is not affected by damp even under unfavorable conditions, is free from mold, and is sweet and wholesome. Moreover, compression destroys all forms of larval life, and flour is thereby rendered safe from the attacks of insects. The saving in storage is enormous, as the cubic space occupied by 100 pounds of loose flour will hold more than 300 pounds of the compressed article.

It is often highly necessary, especially in the jungle, to be able to find out the points of the compass. Few carry compasses with them. Almost everyone wears a watch. Point the hour hand of the watch in the exact direction of the sun. Due south will be exactly between the hour indicated and 12 on the dial, no matter what the hour of the day may be. Thus if it is four o'clock by the watch, and the hour hand is pointed directly to the sun, due south will be in the direction indicated by the figure two on the dial.

The Dutch Government has introduced in the Chambers of Legislature a bill proposing the abolition of export taxes on Java sugar, without compelling the sugar industry to pay any other taxes in its place to the treasury of the island. The proposed law does not make any change in present state of affairs, the export tax laws not having been enforced for a long time, by the passing of a law each year, annulling them for the ensuing year. The Dutch ministry simply change into a law a provisional favor, the maintainance of which the sugar industry of Java urgently demands.

The experiment of importing oranges from Australia in ordinary cases without refrigerating en route, has not been a grand success, judging from the out turn of the fruit ex S. S. Lusitania, which must have been disappointing to shippers. Not a single case out of 1,157 catalogued was sound, and many lots contained so much waste that two boxes were required to make one sound when re-packed. Prices ranged from 5s to 17s per box; but it must be said that the fruit was delicious, and sure to find favor if shipments can be made in better condition.—London Grocers' Journal.

Few people are aware of the extent to which the orange trade of California has grown. Recently, seventy-five carloads of these oranges arrived at New York in one week, mostly in a satisfactory condition. The best navels, of large size and bright red color, sold at auction, as all fruit is there sold, from $3.15 to $2.85 per box. Other kinds fetched from $2.50 for fair to $2.00 for small sizes. The year's crop has been estimated at 5,000 carloads, and in the absence of choice Florida oranges, the Eastern demand has been steady and good. The California, Florida and Jamaica oranges are driving out the fine Mediterranean fruit, which now finds a market in Europe.

Cultivate vanila, wherever soil and circumstances permit, is the advice to be gathered from the report of Mr. H. Cockburn Stewart, Administrator of the Seychelle Islands, who in forwarding his annual report gives special prominence to the vanila industry, which is experiencing quite a boom. The crop last year was the largest on record—63,000 pounds, and the prices obtained on the London and Paris markets were such as to delight the hearts of the cultivators. "Nothing pays better than vanila," remarks the head of the local government, and when the islands are still further opened up by roads, he anticipates a large increase of the acreage under vanila cultivation.

Honduras, the land of frequent revolution, is very fertile in the production of coffee, sugar, bananas, cocoanuts, and other fruit. Java can't produce better coffee. Sugar cane grows as tall and as sound as a pine sapling. There are no vast plantations of bananas, but each and every adult raises several or more bunches for shipment. Bananas are raised in patches in the shadow of the mountains, in small clearings surrounded by almost impenetrable giant and gorgeous vegetation, around the little thatched roof dwellings and in wells and holes in the ground. Ships, mostly from New Orleans, make regular trips for this popular fruit, and buy it delivered on the boat for sixteen cents a bunch. Every bunch must average "eight hand."

The following very pleasing statement relating to the sugar industry of Louisiana is from the Tradesmen:

The sugar planting business in Louisiana has been prosperous. The crop of 1897 will be the second largest of record. The average grade of sugar is better than last year, the price much advanced, and a good profit returned the sugar growers.

The result has been an advance of from twenty to twenty-five per cent. in sugar property, many old plantations being brought under cultivation that have been idle since the Civil War. Many plantations have already begun planting, and the acreage for next crop will be increased, as compared with 1897, at least eighteen per cent. Last year's acreage was about eight per cent, above that of 1896.

Owing to the scarcity of small coins in Hawaii, the Minister of Finance has proposed, and the Legislature will probably authorize, that twenty-five thousand dollars of the silver quarter dollars, which have been lying uncalled for in the treasury vaults for ten or twelve years, shall be recoined into dimes and half dimes. If half the above sum, say $12,500, is allotted to each denomination, it will provide a supply of 125,000 dimes and 250,000 nickels, besides paying for the cost of recoining. This number of dimes and nickels will be none too many for the increasing demand for these small coins all over the islands. Nothing helps more to reduce the cost of fruits and vegetables, and to increase the demand for them among the laboring and poorer classes, than an abundance of small change, which enables them to buy only what they require, and pay on the spot.

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HANDLING OF SUGAR CANE AT THE CARRIER.

In the "Louisiana Sugar Cane" of February 12 is an interesting though not very satisfactory symposium on the above topic. Four writers present their views before the Louisiana Sugar Association, each stating the custom in vogue, discussing the heavy expenses attending this branch of sugar making and their views as to what is required, suggesting various methods by which economy may be secured. One writer—Mr. J. R. McQuiston—states in the following extracts, the conditions of the problem which is sought to be worked out:

"The sugar houses of Louisiana are so unlike in construction, capacity, appliances in operation and general surroundings that, in a great measure, each must be "a law unto itself." What is the best method for handling cane at the carrier of one mill might not be the best for another, even of the same capacity.

"However, for our purpose, we may consider our mills in a general way in three classes:

"First—Those receiving all their cane in standard gauge railroad cars.

"Second—Those receiving only in tram, or plantation cars, and

"Third—Those receiving only in carts or wagons.

"It is true that some of our mills receive cane by all of these methods at once, but they are the exceptions, and as indicated above, existing conditions and surroundings must largely dictate the best method."

Another writer—J. W. Bodley—refers in his communication, to a new cane feeder, which, he claims, does its work at a cost of one cent or less per ton:

"This brings us right down to the bones of our subject for dissection, figures! And figures are sometimes very dry bones, but in this instance the dry bones live, move and prove that cane has been, can and will be placed on the carrier with a feeder [the Bodley-Mallon Cane Carrier Feeder] for one cent or less per ton. Some say 8-10 of a cent, others $\frac{1}{2}$ cent, and one man says $\frac{1}{3}$ of a cent. But that is figuring to near the ragged edge of zero for safety. If I might venture to voice the predictions of some thoughtful observers, I will say that the time will come before many years when the number of mills grinding from 500 to 1,500 tons of cane per day will be in excess of those grinding less than 500 per day. That, with increased facilities, railroad and better water transportation, the trend is more and more toward larger mills and central factories, and that the bulk of the sugar cane will be transported by rail, and where cane is boated by water, it will be transferred into cars, and from cars on to the carrier by machinery."

Mr. Bodley's remark regarding the future of sugar mills, that they will increase in size and in their facilities for crushing cane on a far larger scale than is done now, is no doubt correct. Large sugar mills like large sugar refineries, can do their work at much less cost than small factories. The days of small mills and poor extraction of the juice are rapidly passing away and only large factories, doing powerful and rapid and economical work can survive in the fierce struggle for existence that is now coming on between cane and beet sugars the world over.

This topic of handling cane at the carrier is one of such general interest here, that we should like to see it taken up and discussed by Hawaiian planters, and are quite sure that an interchange of views and experiences will be of benefit to all, by bringing out points that may result in the adoption of new methods, crude at first, perhaps, but eventually resulting in advantage and economy, as compared with those now in use.

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THE ALGEROBA OR CAROB TREE.

In a recent issue of the Monthly Bulletin of the Jamaica Botanical Department, we find the following note: "The carob tree has for many years been growing in some of the public gardens, but has not proved to be satisfactory. It will probably grow in many dry rocky places in this island, where the guango, which bears a similar pod will not flourish; but the results obtained so far have not warranted a recommendation to penkeepers to plant it."

Following this note, the Monthly quoted devotes several pages to the best modes of propagation and cultivation of this tree, the account having been furnished by the British Consul at Naples, Italy. The consul's report is very full of details how to plant the seeds, how to rear the young plants in pots, how and when to transplant them out, and recommends the pods as the best food for horses, how to graft the tree and trim and care for it—advice that to those who are as familiar with this tree as we are, sounds very silly. It seems to us quite singular that the carob tree does not flourish in Jamaica's warm climate as well as it does here in Hawaii. Still, when we reflect that it will not flourish on the windward sides of our own Islands, and only along the leeward sea shores, like the cocoanut trees, it is not so surprising.

The first seeds of the carob or St. John's tree were brought to these Islands about the year 1840 by Bishop Maigret and his associates from South America, where it was called by the Spaniards the algeroba. And the first and oldest tree of this species on these Islands is now growing in the north corner of the Catholic Church premises on Fort street in this city. Its trunk is about three feet in diameter near the ground, while its limbs stretch to a height of forty feet or more. There are larger and taller trees, perhaps, of this species growing in the city, but this one is a fair sample of many others. It will only thrive on the leeward sides of the different Islands of this group, and up to an elevation of say, five or six hundred feet above the sea. It bears pods very much resembling those of the string bean, and in each pod there are from ten to thirty or forty small beans, enclosed in a sugary covering, much relished by horses, cattle, swine, etc. In fact it furnishes the most relishing and fattening food that can be given to them, even better than oats or corn. These pods ripen from June to January of each year. The milk of cows, that are fed on these pods is said to be richer than of those fed on any grass or grain; while hogs fatten very quickly when fed on them exclusively.

Since its introduction here, this tree has spread over the leeward sides of this and other Islands of the group, from Koko Head on the east to Kaena Point on the west, a distance of fifty miles or more and in some places, as between Ewa mill and Waianae, it makes an almost impenetrable jungle. Besides furnishing a cheap food for animals, it supplies the best of firewood for domestic and all other purposes. In short, it may be called the most valuable tree that grows on these Islands, while here on Oahu, it has become almost indispensible for fuel and food for animals.

There are two kinds of this tree—the thorny and the thornless. The thorny trees grow much larger and comprise most of the wild trees. At Waianae, on this Island, for instance, one will notice the trees covered with fierce savage thorns, often one and a half inches in length, rendering the thickets almost impenetrable to man or beast. Where these trees are planted or allowed to grow around dwellings, only the thornless kind should be selected. They are not so good for fuel perhaps, but are much more desirable for lawns and enclosures near dwellings. The algeroba or carob is unquestionably the most valuable tree growing on Oahu.

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A NOTEWORTHY HAWAIIAN GATHERING.

On the evening of March 5th, Mr. Theophilus H. Davies gave an entertainment to the employes of the Honolulu Iron Works —an institution which has become so identified with the sugar interests in these Islands that a brief notice of it will not be out of place here, and may serve to show that native Hawaiians are capable of standing on an equality with artisans of their class in any part of the world. There were about 225 employes of the establishment present on the occasion, and of this number about 175 were native Hawaiians, some of whom have been connected with it for twenty-five years, all or nearly all speaking the English language, and considered equal to any foreign workmen of their class. A few representative gentlemen were present as invited guests, and the occasion proved to be one of those pleasant reunions which Mr. Davies has a happy faculty of providing for his friends. At the close of the repast, in response to calls, Mr. Davies rose and addressed the company.

Men of the Honolulu Iron Works. I want first to assure you one and all that you are heartily welcome to this little feast, and that I am very glad to see many of the employes of the Honolulu Iron Works present. (A voice called for three cheers for Mr. Davies which were given with a will). I want also to assure you that I am pleased with your loyalty to the Honolulu Iron Works and that although I am shortly to leave Honolulu, my one thought is success to all who are connected with them. Now every speaker must have a subject or text. My text for this evening will be short. It will consist of three words only. Honolulu Iron Works, no more. Many speakers in and out of the pulpit divide their texts into three divisions and I shall follow their plan.

The first word of my text is HONOLULU—Honolulu is the capitol of this country, but it represents more than the capitol. It does not represent Hilo, it is true, but then Hilo is jealous of Honolulu. If you don't believe it, ask Mr. Kennedy over there. He comes from Hilo. Honolulu represents Hawaii generally, and what helps Honolulu benefits the whole country. Hilo has got a volcano, it is true, but she has no such institution as the Honolulu Iron Works, and when she wants good machinery she comes to us.

The next word of my text is IRON. Iron is a very useful article as most of you know who handle it daily. I want you men to remember that the employes of the Honolulu Iron Works are all linked together, that no one of you can get along without the assistance of the others. There is running in my mind the refrain of an old English song about the miller who dwelt on the banks of the Dee, who sang "I care for nobody and nobody cares for me." That may be all very well for a miller, but it won't do for a blacksmith, for every blacksmith and every man of the 225 employes of the Honolulu Iron Works—I should say there were 295 by the look of the tables in front of me—is dependent on the others. No man can build a nine roller mill by himself but many men working for the common good can do so. Iron is the symbol, according to Solomon, of truth, loyalty, devotion and brotherhood, and all I ask of you men is that you will remember this, and that in your daily work you will be loyal to your employers and true to yourselves.

The next word in my text is WORKS. Some pretend that only the planters work and that they and the agents are properly described in the book of Job, where "The oxen were plowing, and the asses were feeding beside them." Now that is not true. The agents really do their share and more too, and as for the Honolulu Iron Works employes, with relation to the chief industry of the country and the simile, all the men are oxen. There is no place in the establishment for loafers and they don't have them in the shops anywhere.

I notice that it is quite fashionable here now to wear a badge of some organization, baseball, bicycle club and what not. I hope you men will wear a badge in your hearts if not on your sleeves, and that is the badge of the "Honolulu Iron Works." And right here I want to correct a statement that was made only a day or two since about the capital invested in the Honolulu Iron Works. I want to make this statement in the presence of you all and I hope you will not forget it. Every bit of the stock of the Honolulu Iron Works not owned here is owned by three ladies, widows and sister of those who helped to make the Iron Works what they are. Surely there is not a man in the hall who can begrudge those three ladies the dividends they receive from the fruits of your toil (Loud cries of No! No!) We who manage and direct the Iron Works have but one thought and that is "How shall we keep the works going for another year." I am happy to say that there is abundance of work in sight to keep us going for the year to come. When I came to Honolulu last, one of the first things I read was a description in the newspapers of the new nine roller mill for Honomu. Now, when the big sugar mill for Honomu plantation was built at the works, it seemed a treasured and beautiful thing to many of the men who had to do with its construction. One of the men remarked one day that it seemed a pity that such a production should be destined to be hidden away in a gulch on Hawaii. Well, before that mill was shipped it was looked at most carefully by all the plantation men who were able to call and the slightest details of it were inspected and commented upon. It came out then and it came out more positively after the mill was in operation and was doing all that had been promised, that putting the most skillful and honest work and the best material into it had paid and had been right and proper. Every man of the works has a right to be proud of such an output.

You remember that Austrian frigate that was repaired here many years ago when Foster and Young were in charge of the work. It was said when she got back home that the only good work in her was that which had been put in at Honolulu. Good work always stands everywhere. You may all find in the Honolulu Iron Works a constant model of what your own lives are. It is the small things that go to make up the character of the Iron Works. It does not need 225 men to make a mill but that every man that works on it shall do his level best, even if he has but to drive a rivet. Let every man build up his own character as he builds up a piece of machinery, bit by bit. Never shirk your work and never be afraid to point out a defect. In all the years we were associated together, Young and I were never ashamed to look each other in the face, there was nothing ever hidden between us, we worked for the common good, and so it should be with all of you. I notice many of the old boys here tonight, they were boys when the works started and now I call them old boys. Well, the Honolulu Iron Works is not ashamed of her children, old or young. They are established for the good of the country, the good of the people and everybody connected with them.

Addressing himself to the native Hawaiians, Mr. Davies said it was a pleasure to see so many of his friends here this evening. He believed they were as a nation growing into stronger and more stable manhood. He urged them to take their stand on principles rather than issues. They have in their hands the welfare and future of the land. If people could only see them standing together firmly, a tremendous influence would be felt. For the benefit of the foreigners, Mr. Davies quoted: "Seek ye the peace of the city whither I have carried you." All the men addressed should weld themselves together for mutual good. Mr. Davies closed by reference to the Divine injunction to seek the kingdom of righteousness and the promise in this connection that all else would be added.

Mr. Alexander Young, the former manager of the Honolulu Iron Works, having been called, rose, and was greeted with a storm of applause. After it subsided, he remarked that the occasion took him back to old times, when he entered the Iron Works nearly thirty years ago. It was then a very small establishment, and what pleased him now more than anything else was the sight of so many native Hawaiians connected with it, as employes. He advised them all to stick to their trade, for there is no better employment to be found. Speak- of the assistance of sugar agents, he said: The Honolulu Iron Works would have little to do were it not for these agents, and they have to thank them for bringing so much of their work to Honolulu instead of sending abroad for it. The establishment has lost no character for the good work since he left the management, and only the best material and the best labor obtainable is employed. Let the world know that if a man is not a good mechanic, the Honolulu Iron Works has no use for him. He wore in his pocket a gold watch given him by the employes of these works as a token of their esteem just nineteen years ago. He treasured it as highly today as he did then, and he treasured also the renewed evidence of kindly esteem shown by the cordial greeting tonight. But the greatest token of kindness that they can give is that they be steady, honest and earnest. Remember that it is mean to conceal a defect in work that has been caused by negligence or misfortune. It is a source of regret to him that so much of the ten or twelve thousand dollars a month that has been paid out by the Iron Works has not gone to the purchase of necessaries of life, but rather to that which helps neither body or soul. In all his experience with men he never yet saw an instance where a man left his work in business hours to get a drink but that in the end drink became the master and he the slave. This was the greatest fear he had for Hawaiians, the fear of drinking. In closing, he urged all the employes to strive and keep up the good name of the Honolulu Iron Works, as an institution creditable alike to the city and to Hawaii.

THE SUGAR TRADE—HAWAIIAN PRODUCT IN DEMAND BECAUSE OF ITS QUALITY.

(N. Y. Commercial America.)

Sugar stories are always interesting reading to the American people. Whether it is the sweetness of the subject, whether it is that sugar is one of the necessaries of life and forms an important factor in the expense account of every household, whether it is that it has always been next to impossible to acquire reliable information upon the subject of sugar, whether it is on account of the existence of a Sugar Trust, or whether it is because of Congressional pleasantries the people must apply for themselves, which of these reasons adds to the interest which all feel in this important topic of trade.

The particular point of view for discussion is the disposal of this season's Hawaiian sugar crop, its effect upon the refineries and upon consumers and its bearing upon the sugar trade generally and the Eastern trade in particular. It has been customary for years back for the sugar refineries in California to buy and consume all the sugar grown on the Hawaiian Islands, but since the establishment of the beet sugar industry they has been an over supply on the Pacific coast, and some of the Hawaiian sugar has been coming round the Horn to New York. This year's Hawaiian crop is expected to reach 250,000 short tons, or 225,00 long tons. As the consumption of the three Pacific Coast States aggegates only about 70,000 tons, the problem arises, "What will become of the remaining 180,000 short tons?"

The usual contract between the Hawaiian sugar planters and the Sugar Trust, or American Sugar Refineries Company, expired with the close of last year. January 1 inaugurated a new deal. For some reason or other, the Hawaiian planters, practically acting as a unit, have decided not to sell this year's crop to the trust. They made no overtures to the trust to buy the sugar, but went their own sweet way, sought and found new buyers. The trust has been in the habit of allowing itself a discount of 3/8 of a cent per pound upon all the sugar it bought from the Hawaiians. Upon a crop of 200,000 short tons, or 400,000,000 pounds, this would amount to the nice little sum of $1,500,000, which is a very neat little income for making a few entries and transfers in a set of books of account. With the Hawaiian sugar goes this turnover, and, as most of the Hawaiian sugar seeks other refineries than those of the American Sugar Refineries Company, the trust's commission account will be corresponding diminished.

The present price of raw sugar is approximately $85 per ton, which means a total of $21,250,000 for this year's crop. Transactions of this amount do not occur every day, hence the interest and speculation that has been surrounding the sugar trade. It is generally agreed by sugar brokers, dealers and refiners that 90,000 tons of the Hawaiian crop will reach the New York market, the first consignments arriving about April next. This represents part of the crop grown by those Hawaiian planters who are not disposed to be on friendly terms with the Sugar Trust, and it has been disposed of to B. H. Howell & Company, who are agents for the Independent Mollenhauser and National refineries, acting both as buying and selling agents for these two concerns and operating according to their own ideas of supply and demand in the trade, though without any show of active hostility to the trust.

The remainder of the Hawaiian crop will be shipped to San Francisco, part going to the Sugar Trust's refinery and part to the new refinery now building at Crockett, known as the California Beet Sugar and Refining Company's property. One of the leaders in the formation of this company was R. P. Rithet, but with whom are associated most of the independent Hawaiian planters. Both this new refinery and the trust's refinery in San Francisco will each receive about 70,000 long tons of Hawaiian sugar, the whole crop being divided, according to Secretary C. Bolte, of the Hawaiian Sugar Planters' Association, as follows:

	Short Tons.
From the Island of Hawaii	119,600
From the Island of Maui	41,047
From the Island of Oahu	28,929
From the Island of Kauai	54,414
Total	243,990

Of this amount the trust will receive 40,239 tons through the agency of T. H. Davies & Company, 37,325 tons through the agency of W. G. Irwin & Company, which is the Hawaiian house of Claus Spreckels, and 3,804 tons from H. A. Widemann. The Hawaiian agents who sell their sugar independently of the trust are:

Hawaiian Agents	Short Tons.
H. Hackfeld & Company	46,259
C. Brewer & Company	30,581
Castle & Cooke	44,330
F. A. Schaefer & Company	19,168
M. S. Grinbaum & Company	8,124
Henry Waterhouse & Company	2,994
Alexander & Baldwin	11,167
Total	162,623

This gives 81,368 tons to the trust and 162,623 tons of Hawaiian sugar to the independent refineries here and on the Pacific coast. The reason why the planters were generally opposed to doing further business with the trust was, so it is believed, because the trust was not satisfied with the rebate of $\frac{3}{8}$ cent below New York prices, but also wanted to impose other conditions that were deemed decidedly objectionable. Out of the total of 243,990 short tons of Hawaiian sugar, 90,000 tons will be placed in the New York market, the other 134,000 tons finding an outlet in the Pacific coast markets. California will also supply some 55,000 tons of beet sugar this year, so Willett & Gray say. The Watsonville and Salinas beet factories of Claus Spreckels will produce 29,000 tons of raw beet sugar, which will be shipped to San Francisco, to be refined by the trust, thus giving a total supply of about 100,000 long tons to the big combine. The other California beet factories at Chino, Los Alamedos, Alvarado and Hueneme will produce about 26,000 tons of refined sugar. Besides these, the new independent refinery of the Hawaiian planters will produce about 5,000 tons of refined beet sugar. Thus there will be a total of about 100,000 tons produced on the Coast besides the 100,000 tons handled by the Trust. As the output of the Trust's San Francisco refinery is 5,000 barrels daily, the 100,000 tons which they control there will keep them running for less than half the year, and if they need additional sugar they must buy it in the open market from Java or Manila, paying the full duty and receiving no rebate of threefourths of a cent per pound on their purchases. In this respect the independent refinery, which has a daily output of 2,500 barrels only, will have a decided advantage in the cost of production.

When Mr. John E. Searles, treasurer of the American Sugar Refining Company, was asked to discuss the Hawaiian sugar situation he excused himself on the ground that "for special reasons he would rather not talk about Hawaiian sugar at all."

As a matter of fact the total consumption of sugar in the three Pacific Coast States—California, Oregon and Washington—is but 70,000 tons annually. But the Western refineries have always supplied a certain section of the more Eastern trade, L. W. Minford & Co. saying that they reach such points as St. Joseph, St. Paul, Kansas City, Omaha, Denver, Atchison and the Montana trade. Including all the Missouri and Mississippi markets, as well as the Pacific coast, the total demand is but for 150,000 tons of sugar, so that the California supply would be equal to meeting all of these requirements with a surplus of 50,000 tons of refined sugar, and even more than this if any considerable quantity of sugar reaches San Francisco from China, as has been the case quite recently.

There is but one outlet for this surplus supply, namely, the Eastern markets, and there is every reason to believe that Chicago will be the dumping ground, as it has been occasionally in former years when the California refineries had a surplus. The immediate effect of shipping periodical train loads of sugar to Chicago will, of course, be to break prices and weaken the market, and there is every probability that the trend of events in this year's sugar trade will be somewhat interesting. It is certain, however, that the Pacific Slope need fear no return to the sugar prices of olden days, when the Golden Gate, San Francisco and Pacific, and the Bay Sugar Refinery companies were subsidized by Claus Spreckels to shut up shop. Then Spreckels' California refinery hummed along happily, selling its product at 17@18 cents per pound, and even up to 20@22 cents when Spreckels could work up a corner. The present price of refined sugar in San Francisco is 5¾ to 6 cents a pound, but, with the coming competition between the trust and the Hawaiian independent refineries, something is likely to drop, and a slump in prices seems to be inevitable. This break will extend to Chicago and through the Eastern markets as soon as the Western surplus is forced for sale. As the freight rate from San Francisco to Missouri River points is but 25 cents per 100 pounds, as against a 40-cent rate from New York and Philadelphia, it is evident that the Western refineries can easily hold those points.

One of the effects of the shipments of large quantities of Hawaiian sugar is the establishment of a New York office by the San Francisco house of Williams, Dimond & Co., who are agents for independent Hawaiian planters and do a large export trade to the islands. It is quite possible that they may try to develop the export trade from New York, loading up some of the sugar ships that arrive here from Honolulu with return cargoes of American goods, thus increasing the Eastern export trade with the islands.

Eastern refiners are glad to handle Hawaiian sugar because of its excellent quality, and the receipt of a portion of our supplies from that direction simply means that less beet sugar will be brought here from France, Germany and Austria and less cane sugar from Java and Manila. The condition in Cuba, where cane fields have been so wantonly destroyed, helps to make the Hawaiian imports possible.

The daily consumption of sugar in the United Sates is now about 40,000 barrels. The capacity of the trust refineries is 39,200 barrels; of those refineries that operate in harmony with the trust, 7,700 barrels daily, and of the independent refineries, 10,900 barrels daily. A combination of the independent and friendly refineries, with an output of 18,600 barrels a day, would make a very lively sugar market. A list of all the active refineries in the country is as follows:

Trust Refineries.	Daily Capacity, bbls.
Havemeyer & Elder, Brooklyn	9,000
Franklin, Philadelphia	7,000
Spreckels, Philadelphia	5,500
New Orleans, New Orleans	6,000
Jersey City, Jersey City	5,000
Standard & Continental, Boston	4,000
Western, San Francisco	2,700
Total Trust capacity	39,200

Friendly with the Trust.

Mollenhauser, Brooklyn	3,000
National, Yonkers	2,000
McCahan, Philadelphia	1,500
Revere, Boston	1,200
Total capacity	7,700

Independent.

Doscher, Long Island City	3,500
Arbuckle, Brooklyn	3,500
California Beet Sugar & Refining Co., California	2,500
Henderson, New Orleans	500
Cogswell, New Orleans	400
Cunningham, Texas	500
Total Independents' capacity	10,900

With the growth of independence among sugar refiners who are not controlled by the Trust, aided by this new move on the part of the Hawaiian sugar planters and the construction of their own refinery in California, the outlook is decidedly encouraging for cheaper sugar for the consumers.

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THE SUGAR INDUSTRY IN BRITISH GUIANA FOR 1897.

After giving a brief sketch of the visit of the Royal Commission to the West Indies and Guiana, with the unhappy results arrived at by it, the Demerara Argosy, in its annual review of agricultural industries in that colony for 1897, makes the following sharp criticism: "If Britain, with all the facts now before her, refuses to extend justice to her sugar-producing colonies, at a slight sacrifice to herself, then it is evident she has lost all interest and care for them, and she should arrange for their transference to some other power, able and willing to combat the aggressive commercial warfare, carried on by foreign nations. The sacrifice called for on the part of the Mother Country is slight, it is admitted to be in the interests of fair play and free trade, and if decisive action be not taken, whilst there is yet time to save the Sugar Colonies, the British Nation will be responsible for the ruin of thousands of industrious and loyal colonists, and will ere long fully realize that the selfish and petty policy adopted is certain to cost the nation much more dearly than an honorable and merciful recognition of the just and indisputable claims of her colonies would have done. That outcast, British Colonial cane sugar, has had every market shut against it, either by large stocks of bounty-assisted beet sugar or protective tariffs, and still it has struggled on. The surplus of the European production of beet sugar has been sent to the common dumping ground of the world, London, and sold there at prices often far below its cost of production. Many industries now considered secure and prosperous would have succumbed long ago if they had been exposed to the treatment the British Colonial sugar industry has received. Cane sugar, in any stage of its manufacture, is fit and pleasant for consumption; but raw beet sugar is an abomination, and it has to be thoroughly refined and purified before it is fit for human food.

Regarding the sugar crop of 1897, the report says: During the year an intense drought prevailed throughout the first four months, and cultivation suffered severely in consequence. The effects of the drought were intensified from the fact that the rainfall during the closing months of 1896 was unusually light. The yield of sugar obtained throughout the Colony was below the usual average. The value of the year's crop of sugar including its by-products, will be about five and a half million dollars. The extreme poverty of juice reduced the yield of sugar from canes, in some cases to the extent of 20%, as compared with the yield obtained under average conditions. The total yield of sugar got per acre was not, however, so much reduced, as generally speaking, heavier crops of cane were obtained. The abnormal poverty of cane juice was evidently caused by the unfavorable weather conditions prevailing. Rind fungus did considerable damage to canes in certain districts, and must have to some extent contributed to conditions that detrimentally affected the quality of the juice. On the whole, however, the ravages of this disease were less marked than during the two previous years, and there is some reason to hope it may soon disappear altogether.

The exports of sugar for the year amounted to 99,780 tons. The exports for the three previous years were as follows: 1896 105,271, 1895 95,919, 1894 102,897. It is estimated that about 6,000 tons of sugar are consumed in the colonies annually.

The land under cane cultivation during 1897 extended to 66,236 acres, as compared with the undernoted acreages during the previous five years: 1896, 66,908; 1895, 68,333; 1894, 70,012; 1893, 75,926; 1892, 76,101.

It is satisfactory to observe that the reduction of area under canes which had been steadily taking place for a number of years has ceased, and if bounties are abolished and labor is provided, a forward movement may be expected. There are now 61 estates in the Colony on which sugar is manufactured, and they may be grouped as under: 4 estates under 500 acres in cultivation; 27 estates 500 acres and under 1,000 acres; 17 estates 1,000 acres and under 1,500 acres; 9 estates 1,500 acres and under 2,000 acres; 3 estates over 2,000 acres; 1 estate over 3,000 acres.

During the past three years a very limited number of immigrants have been introduced, and estates' indentured gangs are now being reduced at the rate of about 3,000 immigrants per annum. A good deal of labor formerly available for work on sugar estates has been devoted to the rice industry, and this industry will continue to employ an increasing number of laborers for some years. The continuation of immigration is an absolute necessity if the sugar industry is to be successfully carried on, the only other alternative being a large and steady reduction of area under cultivation. Judging by difficulties already experienced, some estates will find it nearly impossible to reap their crops during the last quarter of 1898. During the 1897 immigration season, two ships arrived bringing immigrants equal to 1,149 statute adults, whilst three ships left the colony conveying immigrants back to India equal to 1,445 statute adults. These immigrants took with them money and jewelry to the value of $58,958. The number of immigrants introduced during the four previous seasons was as follows: 1896, 2,248; 1895, 1,799; 1894, 6,051; 1893, 5,569. An earnest endeavor should be made to arrange that immigration from India should be carried on without the unreasonable and unnecessary condition which secures a free return passage at the expense of the immigration fund. This condition adds enormously to the cost of immigration and deprives the colony of much needed labor and capital year by year. The credit of the colony should be pledged, and money borrowed to cover the entire cost of the introduction of not less than 5,000 immigrants annually, and these immigrants should not be entitled to a free return passage to India. In this way the sugar industry would be helped and made prosperous, the population of the colony would be steadily increased, and the eventual development of its resources accomplished.

Very little outlay was incurred on new machinery during the year, except what was actually necessary to make good wear and tear. The uncertain conditions surrounding the sugar industry on account of disturbance caused by bounties, renders it unwise to invest capital in improvements or extensions. It may be said, however, that existing sugar estates, with some exceptions, are being maintained in fair condition. At range of prices ruling during 1897, no sufficient margin was available, after paying ordinary expenses and providing for ordinary wear and tear, to meet the heavy outlay at times necessary for the renewal of machinery, buildings, &c., &c., nor to meet losses that must at times occur during very unfavorable seasons.

The outlook as 1898 opens is encouraging as far as the sugar market is concerned, and prices are at a remunerative level, thanks chiefly to the policy of the United States in levying, in addition to ordinary duties, a countervailing duty on bounty-assisted sugar. The growing crop generally speaking is in a promising condition.

MINOR INDUSTRIES.—As usual there has been a great deal of talk about minor industries, but little or no practical result; and if the sugar industry were to fail, the colony would be fairly and squarely ruined. Those who pretend to believe otherwise are either rogues or fools. Even if it were possible that other industries should gradually replace sugar in the colony, their only chance of success would depend on having sugar as a basis to start from and work upon. The sugar planters have been often charged with delaying the development of minor industries. But in what way have they done so? Their capital is invested in sugar estates and machinery, and is it reasonable to expect them to desert their properties, and give up the employment of a life-time to follow any "will o' the wisp" in the shape of a minor industry. If the sugar industry fails, their capital and employment will be gone, and they will be cast forth ruined and broken men.

In the early part of this century, coffee was successfully cultivated in this colony, but it by no means follows that its cultivation would pay now-a-days. At the period referred to, the cultivator had a certain supply of labor secured to him on which he could implicity depend; and coffee, owing to the limited area over which its cultivation extended, commanded an average price much in advance of what can be got now. In recent years coffee cultivation has been extended in countries where soil and climate are more favorable to its growth than that of this colony, and where labor is more abundant, reliable and cheaper. It is also largely produced in countries possessing a silver standard of currency, and this enormously cheapens the cost of production. The price of coffee in New York during 1897 was as low as 4c. to 5c. per lb. In the local market price averages 12c. per lb., and there is an import duty of 3c. per lb., and yet over 200,000 lbs. of coffee per annum are imported to supply local consumption.

The only minor industry that has made any notable advance is that of rice cultivation, and this owes its progress almost entirely to the encouragement and support afforded it by sugar planters. At least half the area under rice in this colony now, is situated on sugar estates. The rice industry has come to stay, and all the rice required for consumption in the colony will be produced locally. There is not much hope of a paying export trade, as it will be difficult to compete with the cheaper product of India, where labor is one-sixth of the cost it is in this colony.

No minor industries, except rice, cocoa and coffee, and the usual cultivation of ground provisions, have been established. There has been some interest displayed in tobacco, rubber and fibre industries, but nothing very definite has been done, nor have results of experiments with tobacco and fibre plants been very encouraging. The dearness, scarcity and unreliableness of labor, forms a great stumbling block to any endeavors made to start a new industry, and entirely prevents the introduction of new capital. The bulk of our peasantry are not sufficiently industrious or self-reliant to start small permanent cultivations on their own account, and until the colony possesses a teeming population, little improvement may be looked for, as with a kindly soil and climate, the conditions of life are extremely easy, and ambition rarely disturbs the even tenor of the peasantry's existence.

Cane-farming has been encouraged by various owners of sugar estates, but, so far, the progress made has been very slow, although every inducement has been offered to the cane farmer. Ground provisions of all kinds have been abundant and cheap during the year, and the most indolent of our laboring population can scarcely have suffered from the pangs of hunger, which are so often experienced by their less fortunate brethren in more northern latitudes.

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MR. OXNARD IN ERROR—THE SECRETARY OF AGRICULTURE REPORTS ON HAWAIIAN AND BEET SUGAR.

Editor Commercial America:—Just a week ago, on Jan. 17, there was published in your columns several arguments in favor of the policy of Hawaiian annexation from a purely commercial standpoint. Strong facts, sometimes passed over in political discussions, were clearly presented, showing that our commercial relations with the Hawaiian Islands ranked among the first in importance. These arguments have attracted the attention of friends of annexation in Washington, by whom they were found to be worthy of reproduction in pamphlet form, followed by a communication that was sent to the United States Senate by Secretary Wilson, of the Department of Agriculture, which is given in part as follows:

SECRETARY WILSON'S REPORT.

The average amount of sugar imported into the United States annually from 1890 to 1897, inclusive, was 1,830,482 tons of 2,240 pounds each, valued at $101,575,293. The importation during the fiscal year ending June 30, 1897, was 443,323 tons more than the average of the four preceding years, which was 1,752,617 tons, owing to the desire of importers to anticipate the effect of the tariff act pending in Congress during the last months of that year.

The average importation of sugar from the Hawaiian Islands from 1893 to 1897, inclusive, was 149,456 tons, valued at $9,973,924. The importation for the fiscal year of 1897 was 192,508 tons, being 43,052 tons above the average of the preceding four years. During 1897 the Hawaiian sugar was 9.1 per cent. of the amount consumed in the United States. From 1893 to 1897 it was 7.1 per cent. of our consumption.

The beet sugar consumption in the United States in 1896 was 18 per cent.; in 1897, it was 37 per cent. of the total consumption. The disturbed condition of Cuba doubtless caused much of this marked increase, but the beet sugars from countries in continental Europe are those from which we may expect the most active competition. The production of beet sugar in the United States in 1897 was 41,347 tons of 2,240 pounds each; of cane sugar, 287,007 tons; of maple sugar, 5,000 tons, and of sorghum sugar, 300 tons.

The total domestic production was 335,656 tons.

The total refined product of imported sugar was 1,760,607 tons, making the total annual consumption 2,096,263 tons.

From the foregoing it appears that 84 per cent. of the sugar consumed in the United States was imported.

HAWAIIAN SUGAR FIELDS.

A prominent question is, can this Hawaiian production be greatly increased in competition with the American farmer? Free entry into the United States from these islands has given great encouragement to the production of sugar, and the industry has been developed very rapidly. We must take into consideration methods of cultivation in Hawaii before we can certainly conclude what the future of the industry will be in that direction. Sugar cane is grown continuously on the same land in Hawaii, and for this reason the soil is being exhausted. The planters are now compelled to buy commercial fertilizers. The three elements of plant food most necessary to vegetation are nitrogen, potassium and phosphoric acid. Hawaiians will find saltpeter in Chile, potash at the Stassfurt mine in Germany and phosphates in Florida. Guano on the islands of the Pacific is being exhausted and is quite expensive. When it becomes necessary to fertilize the soil in order to grow a crop, the expense becomes a considerable item and must be considered in determining what the effect of the competition would be on American sugar growers.

Sugar will be grown in the United States by American farmers. The Department of Agriculture has been experimenting in two-thirds of the States of the Union during the past year, and will experiment in all the States during the coming year to ascertain where we can grow sugar producing plants most profitably. A detailed report now being prepared for Congress will show the results of the work. The indications that come to us regarding our past season's work are that there is a wide extent of country from the Atlantic to the

Pacific where sugar beets can be profitably grown as an additional money crop.

THE BEET SUGAR INDUSTRY.

The $100,000,000 now paid for sugar is a great incentive, and numerous factories are planned and arrangements for growing beets are being made in many States. The per cent. of sugar in the beets in many parts of our country is much higher than the average in Europe. Sugar beets will be grown most profitably by the American farmer in connection with dairying or meat production. They will not be grown successively on any one piece of ground, but will become a feature of rotative systems, alternating with the grasses, legumes and the grains that recuperate the soil and store it with plant food suitable for growing the beet on any one piece of ground once in four or five or six years. Nitrogen will be replaced by the clovers and other legumes. Potash and phosphoric acid will become available in most of our soils while they are resting in grass.

The American farmer can grow the sugar beet profitably for the dairy cow, young animals and fattening stock, if the sugar is not extracted at all; the Hawaiian has not these auxiliaries. The pulp of the sugar beet contains all the nitrogenous matter of the plant. If this is taken back to the farm and fed to stock, and through that instrumentality returned to the soil, sugar beets can be grown perpetually on the same farm, without at all reducing the fertility of the soil, because the sugar comes from the carbon dioxide of the atmosphere and takes no element of fertility from the land.

The first sugar beet factories established in the United States imported machinery from continental Europe. The ingenuity of our people has been at work and has gradually supplanted every piece of machinery imported, so that both in the field and factory American machinery is superseding the foreign and enabling the American farmer and factory owner to do the work more expeditiously and economically.

HAWAII CANNOT COMPETE.

These considerations lead me to conclude that the system of agriculture pursued in Hawaii, which is certainly reducing the fertility of the soil, cannot compete with a system of farm management in the United States, where the fertility of the soil is not at all reduced. We consume in the United States about 2,000,000 tons of sugar. Something like a million acres devoted to this purpose would produce all the sugar we import into our country at the present time, or 10 acres grown on each one of 100,000 farms in rotation with other crops would meet home demands and do no injury to the soils.

The American farmer will use this crop to diversify the farm system. The Hawaiian sugar grower is a one-crop man, and whenever one crop is perpetually grown, be it wheat or maize, beets or cane, cotton or tobacco, the available plant food in the soil is certain to be reduced below the point of profitable production, and fertilizers are required.

Sugar production in Hawaii is carried on with coolie labor under contract systems. That will vanish if the islands become subject to our laws, when the laborer there will receive the same wages he now gets in California.

IN WHAT HAWAII EXCELS.

Hawaii then will not seriously compete with sugar producers in the States. When the people of those islands come to consider, with scientific assistance, the possibilities of coffee production that can be extended over much of the limited sugar belt, it will be found that in that industry they have a monopoly with which no State in the Union can interfere. It is a singular fact that no scientific improvement of the coffee tree with regard to the excellence of the berry and increased yield of the tree through intelligent selection has ever been made. The climate of these islands is admirably adapted to the production of many fine fruits that cannot be grown in any of our States. They can grow many choice sub-tropical and tropical fruits that have never been scientifically developed, the improvement of which would lead to very profitable production. In these directions the farmers of the States could not compete with Hawaii.

These official statements from the Secretary of Agriculture seem to entirely wipe out the claims made in the columns of Commercial America, by Henry T. Oxnard, President of three of the largest beet sugar factories in the United States. Mr. Oxnard said: "The figures of the factories of which I am President show that we have not been able to make sugar in Nebraska for four cents a pound, but, for the sake of argument, granting that the expert of the Agriculture Department is right, I will say that this sugar can be produced at four cents."

MR. OXNARD IN ERROR.

Mr. Oxnard must be unfortunate either in the location or management of his beet sugar factories, because a prospectus of the Buffalo (N. Y.) Beet Sugar Company, which is issued by Messrs. Willett & Gray, gives the "factory cost" of making granulated sugar at only $2.50 per ton, and the net profits from a factory producing 10,120,000 pounds of sugar at 2.14 cents per pound, figures with which Hawaiian sugar planters could never dream of competing. Again Mr. Oxnard is in error in the following statement: "Another factor which has prevented the Hawaiian sugars from being sold in competition with the home sugar product was the fact that a contract existed between these same Hawaiian planters and the Sugar Trust whereby the Hawaiian planter received the full price of his sugar in the markets of the world (plus the duty, which, however, he did not pay into the Treasury, but transferred to his own pocket). Consequently, the Sugar Trust, having paid the duty on the sugar to the Hawaiian planter, could not afford to undersell the home producer; but a different condition exists since the first of the present month. The Sugar Trust has refused to renew its contract with the Hawaiian Island planters."

If Mr. Oxnard is really not informed as to the exact terms of the contract that formerly existed between the Sugar Trust and the Hawaiian planters, he can ascertain from his brother, Mr. Robert Oxnard, who represents the Sugar Trust in its Western refinery at San Francisco, which was formerly owned by Claus Spreckels, and who is expected to arrive in New York this week, that the Sugar Trust never paid the full market price for Hawaiian sugar, but deducted, under various contracts, from $\frac{1}{4}$ to $\frac{1}{2}$ cent per pound for itself. Mr. Robert Oxnard may also be able to inform his brother that the Sugar Trust did not "refuse to renew its contract with the Hawaiian Islands planters" for the very good reason that the planters never offered the crop to the Sugar Trust, but sold 90,000 tons of it to Messrs. B. F. Howell & Sons, of New York, disposing of the remainder to a new refinery in San Francisco. On the other hand, the two large beet sugar factories at Watsonville and Salinas, in California, both sell their raw beet sugar to the Sugar Trust's refinery in San Francisco. It has been published by Messrs. Willett & Gray that the beet sugar factories of California and Nebraska have paid large dividends, and that "Eastern capitalists early last spring bought up the stock of some of the California beet sugar factories, paying $300 per share for stock that originally cost $100, which stock had paid dividends of $117 per share."

Mr. Oxnard need not feel discouraged as to the outlook for the beet sugar industry in the United States. Both Chinese and Japanese labor are employed in the beet fields of California, as well as in the cane fields of Hawaii, and there has never been any Hawaiian plantation that paid $117 per share dividends on stock costing $100, and subsequently sold for $300. In New Mexico it is claimed that the Mexican and Indian labor for use in beet sugar culture is cheaper than in California, and in Buffalo the cost of production is brought down to a minimum. If these statements are not true, then capital is being invited to engage in the manufacture of beet sugar under misrepresentations, but it is not credible that Messrs. Willett & Gray would lend themselves to any transactions of this sort.

That the beet sugar industry will thrive and increase in the United States is the belief of all who are engaged in it with the exception, perhaps, of Mr. Henry T. Oxnard, who takes too gloomy a view of the outlook. There is room enough for American beet sugar, for American cane sugar and for Hawaiian cane sugar, grown by Americans, in the United States; and Commercial America looks to see them all three thrive and flourish long after Hawaii has become American territory.

AMERICAN.

Washington, Jan. 22.

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INSECT PESTS IN THE TROPICS.

Perhaps one of the most marked faunal characteristics of the tropics is the predominance and peculiarities of its insect life. Whether during the day we remark the brightly-colored butterflies, the varied forms of the beetles, the wonderful activities of the ants and termites, the lace-winged dragonflies, the strange stick and leaf insects; or, at dusk, the large and small moths which flutter round our lights, the shrill note of the crickets accompanying the evening song of other night loving creatures, the flitting to and fro of the various fire-flies: or, still more, experience the tormenting mosquito, or on the trees in our gardens remark the prevalence of strange-looking scales and large and gorgeously colored caterpillars, do we realize the importance of the group here, compared with temperate parts. The constant dweller in the tropics, be he agriculturist or otherwise, has thus his attention continually directed towards the six-legged winged creatures, either in admiration of their form and beauty, or, perhaps more often, in execration at the petty annoyances, to which they subject him and the more serious damage to agriculture resulting from their activities.

Seeing that insects have such a constant influence and importance in our daily lives, we shall observe them with greater interest, may appreciate more their presence or be better able to deal with them as pests, when we know somewhat of their organization and habits. Fortunately there is a general plan of structure applicable to insects which is readily grasped, and which enables us easily to distinguish them from all other animals. Other characters again ally them to creatures appearing at first sight very distantly removed. Primarily we observe their bodies to be made up of distinct rings or segments. This ringed body they have in common with worms, centipedes, lobsters, scorpions and spiders. Their paired legs are likewise seen to be constructed of several parts separated by joints differing in form and purpose according to the position in the body of the part we select. In this they differ entirely from the segmented worms, which have only hairs or bristles to aid them in locomotion, but agree with the remaining groups mentioned. This common character of the appendages enables us to form a great group of the animal kingdom, the Anthropoda, or joined-footed animals. By the numbers of these feet we can also separate the insects from most of the other members of the Anthropoda. The centipedes, lobsters, etc., have a pair, of one shape or another, to every ring; scorpions and spiders have four pairs restricted to the front segments, but insects are all limited to three pairs of true walking legs in the middle division of their body. Again, lobsters and spiders have the whole body divisible into two main portions: insects have, with a few exceptions, three distinct and separate regions—the head, thorax and abdomen. Finally, insects differ most advantageously from all other anthropods in the possession of wings; usually two pairs fixed to the two last rings of the thorax. These are to be regarded as out-growths from the body; perhaps, with their hollow veins, developed primarily for respiratory purposes, but afterwards taking on the very important function of aerial locomotion.

By their means insects alone, among the invertebrates, occupy an exalted and active position in the air, such as is occupied by the birds among the vertebrates. To the gift of wings must be attributed the wonderful numerical success of insects in the struggle for existence as well as that of birds; and, in a measure, their advance in activity and intelligence. To sum up, insects are distinguished from all other animals by the following combination of characters: The division of the body into three regions—head, thorax and abdomen—the two first being separated by a well-defined neck; the possession of one pair of feelers or antennae on the head; the thorax with only three segments, each bearing a pair of jointed legs, and usually a pair of wings to the two last rings; and, lastly, the abdomen with nine or ten segments.

The paired eyes on the head are generally fixed, and differ much in plan from the eyes of higher animals, each being a combination somewhat equivalent to very numerous single eyes. Experiments seem to point to the conclusion that insects cannot distinguish by their eyes the forms of objects, or at best very poorly. The antennae or feelers have important functions, probably connected with motion, touch, hearing, taste or smell.

The external covering of all insects, and indeed of all the Articulata or segmented animals, is a substance, usually more or less hardened, known as chitin. It is an excretion from the soft underlaying cellular layer, the epidermis. In the burrowing earth worms a protective covering is not much required, and the cuticle is very thin and delicate. In crabs and lobsters it becomes impregnated with lime salts, and consequently very hard and a most effectual protection. This would, however, be too heavy for the air-disporting insects. It is to be noticed that the chitinous case is not stiffened at the joints so that movement of one part of the body upon another is allowed. The outer skin becoming hard and inelastic soon after exposure, the necessity for the creatures, while increasing in size, to be occasionally moulting their skin as a whole is obvious.

The internal structure of insects can best be studied in such a form as our common large cockroach. Although a very objectionable and much-despised creature, the cockroach is worthy of our great respect on account of its long ancestry. We occasionally give honor to individuals who can boast only of this as their recommendation, and it is certainly one redeeming feature in the present case. Forms similar to the cockroach are met with amongst the early fossiliferous rocks, and extend, unquestionably without any signs of extinction, down to the present day.

On pinning down a cockroach and cutting away the upper portion of the body-wall the interior is seen almost filled with a white loose substance, which is mainly fatty matter held together by the fine air-tubes or tracheae. When this is cleared away, a partially coiled tube is seen extending the whole length of the body. It is the food-canal of the animal and is divisible into different parts, each with a separate function in the complex process of digestion. Out-growths from it occur at different places; two in front are known as salivary glands, and produce a digestive fluid, and two other groups occur behind. The first, consisting of short, pouch-like tubes, secretes another digestive fluid, and the second group of long slender tubes has an excretory function. The dorsal heart and the blood-vessels are not readily seen. Running all the length of the ventral surface of the body-cavity which is not however a true coelome, is the double nerve-cord, with enlargements corresponding somewhat with each segment, and from which are given off fine branches to all parts of the body. The complex reproductive organs are seen behind.

With some interesting exceptions, all insects develop from eggs. The life of most may be divided into three stages: the larva, caterpillar or grub; the pupa or chrysalis; and the imago or adult; the change from one to the other being spoken of as a metamorphosis. The differences between the various stages are, however, very diverse in the many groups, the obvious alterations being much more marked in some than in others.

THE HAWK-MOTHS.—The hawk-moths are among the large moths which, in the evenings, often fly into rooms. They are stout, strong insects, with large hairy bodies. The sucking tube or tongue is extended to a great length, so that it may reach the sweet fluids at the bottom of flowers with a long tubular coralla.

The caterpillars of the various species are large, stout, and smooth, with very beautiful and striking colors. They are continually brought into the Museum as remarkable objects. Those belonging to the family may usually be readily distinguished by the possession of a hump or horn on the eighth abdominal segment. The pupae are occasionally met with in digging the ground. They are spindle-shaped, often with a long jug-like handle, which is really the case of the sucking tube. The green caterpillar with oblique white lateral lines and a curved hook towards the end of the body, and which lives mostly on the leaves of the tomato, is a well-known form.

Plague of Caterpillars.—Not far removed from the hawk-moths are the insects which have lately given rise in Jamaica to a plague of caterpillars.

A few weeks ago accounts appeared in the papers that the guinea-grass, covering extensive areas in different districts of the southern portion of the island, and also around Kingston, was being destroyed by caterpillars. Specimens of these were sent to the Museum, and were allowed to pupate and afterwards the moth was hatched. They are closely allied to the well-known "army-worm" of America. The long, slender caterpillar lives mainly upon grass, but attacks also corn and sugar-cane. It eats away practically all the young leaves, only the dead stalks remaining. In such numbers do they occur that a whole district may be quickly devastated. The pupal stage in similar forms elsewhere is passed through in the ground, but in the Jamaican species the caterpillar makes for itself a kind of chamber by joining portions of the leaves of grass and forming a thin lining by means of fine threads. In this the small, brown, spindle-shaped pupa passes through its metamorphosis, the result being a medium-sized moth. No further accounts have been received from the country for two or three weeks, so that very probably our worst times are over. The excessive development, at times, of different forms of caterpillars, as compared with other times, is mostly dependent upon peculiarities in climatic conditions.

Since this was first written I have heard from one of my correspondents that the caterpillars, which had disappeared, seem to be now returning in as great numbers, and are again destroying the grass. No doubt these are derived from the batch of eggs laid by the moths resulting from the first caterpillars, and there seems no reason why we should not look forward to a regular sequence of such visitations.

SCALE INSECTS.—The scale insects or bark-lice are well known to every observer in the tropics, and to those conservatories elsewhere with plants from warmer parts. In many respects they form a very peculiar group, and a wonderful variety of species exists within the family, Coccidoe, as it is termed. In appearance and habits they differ greatly from other insects, and even the two sexes of the same species are much unlike. The females pass the greater part of their life entirely motionless on trees and shrubs: nothing in their exterior would lead one to suppose them insects. When mature and ready for laying eggs the scale appears rather as an excrescence of the tree. The males at one stage are lively and active, but have then only a single pair of wings, and no organs for procuring food. The mouth parts disappear during the metamorphosis of the insect, and a second pair of eyes appears in their place. The female is always sluggish and wingless, and in the adult the body is generally scale or gall-like or grub-like and clothed with wax. Though the body of the larval family is ringed and bears legs, all trace of segmentation is usually lost later. Among the Coccidoe are found many of the most serious pests of the horticulturist and agriculturist; scarcely any kind of fruit tree is free from their attacks. The numerous species described from Jamaica by one of the former Curators of the Museum, who made a speciality of this group, is evidence of their great abundance in this island, while almost daily specimens are still sent to the Museum for examination. During recent years much attention has been paid, more especially in America, to devising methods for destroying and checkmating the pests; the insecticides which are now most widely used being alkaline washes and kerosene emulsions.

Perhaps the scale of greatest concern at present in Jamaica is the Mussel scale, Mytilaspis citrieola, affecting the oranges, more particularly in the lower, dried parts of the island. It is not rare around Kingston, and I have received oranges affected with it from St. Ann, but, in the higher orange-growing districts of the island, as at Mandeville, it does not appear to be very prevalent. In its structure and life history it exhibits some most remarkable conditions and may be taken as representative of the group.

The scale in the stage we are most familiar with is a minute brown mussel-shaped body, about one-eighth of an inch long, flattened on its adhering surface, but convex on the other; a slight margin of lighter, less dense material is present. If turned over and examined with a lens, it is seen to be either a dead hollow chamber with a partial membranous floor, or else to contain small eggs irregularly arranged. The manner in which this condition is brought about is one of the most striking processes in insect life. For what follows we are indebted mainly to the researches of the American entomologists. Starting with the eggs laid by the mother, we find that they undergo development, producing minute creatures, mere specks, scarcely distinguishable to the untrained eye. The newly-hatched scale insect is oval in outline, much flattened, furnished with six legs, a pair of antennae, and an apparatus for sucking the juice from plants. After wandering about for a time, usually a few hours or even less, the young insect settles on some part of a plant, inserts its beak, and drawing nourishment from the tissues, commences its growth at the expense of its host. In a short time there begins to exude from the body of the larva fine threads of wax, which are cottony in appearance. Sooner or later the larva begins to excrete a pellicle, which, although very thin, is dense and firm in texture. The mass of cottony fibres either melts or is blown away. After a period the larva sheds its skin; in some species, after the permanent scale begins to form, in others before. In this latter case the larval scale is plainly visible either upon the surface of the scale, or at one extremity, as in Mytilaspis. The change which the larva undergoes in this first moult is a very remarkable one; with the skin are shed the legs and antennae, and the young scale insect thus becomes a degraded grub-like creature, with no organs of locomotion. The mouth parts remain, and by them the insect is firmly attached to the plant and continues to draw its nourishment from it. From this stage the development of the two sexes differs.

In the second and last moult of the female the second skin is joined to the first, and with it forms part of the scale which covers the body of the insect, but generally it constitutes only a small proportion of the ultimate scale, the greater part of which is excreted subsequently to the second moult.

Soon after the second moult of the females, the adult males emerge, and impregnation is supposed to occur at once. The body of the female then increases in size, becoming distended with eggs; these are deposited beneath the scale, the body of the mother gradually shrinking to make room for them. Ultimately the parent dies, but the eggs continue their development; the dead body of the mother, with its scale, serving as a chamber or cradle for their protection until hatched. The male scale insect during the early part of its grub-life is indistinguishable from the female. At the first moult, like the female, it loses its legs and antennae; the second moult agrees with that of the female, but there the similarity in form between the two sexes ceases. It is now in the pupa state, and has long antennae and rudimentary legs and wings. After a third casting of the skin the adult male appears with three pairs of legs and a large pair of wings in front, by means of which it can fly, but the mouth parts are replaced by supplementary eyes, and it is unable to eat. In the particular genus Mytilaspis, to which the orange scale belongs, the scale proper of the female is elongated, and the exuviae or dead skins are seen at one extremity. The scale of the male is similar in form to that of the female, only smaller. Fortunately it does not appear that the scale injures the trees or the oranges very seriously in Jamaica, but the unsightly appearance given to the fruit when the parasite adheres in considerable numbers renders it desirable that measures should be taken to prevent the spread of the pest.—Planting Opinion.

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PROFITS OF SUGAR REFINERIES.

The increasing production of beet sugar in the United States gives promise of some interesting economic results. It must have a serious effect on the revenue from customs long before it can cut down by one-half our annual import of raw sugar; for, if domestic production of the sugar beet is to increase at the rate now established, it will diminish the productiveness of tariff taxes faster than any other influence can be expected to increase it. But the most notable result of the growth of the beet sugar industry will be to render impossible any monopoly in sugar refining. Beet sugar production is necessarily conducted near the agricultural centers where beet culture is carried on. It involves the creation of a multitude of small factories, costing about $200,000 each, and supplying a market not greatly removed from the seat of production. The declared purpose of the beet sugar men is to divert capital from further investment in refineries on the Atlantic coast to refine imported raw sugar, and to induce capital to invest in the hundreds of new factories that will be required to work up the amount of beets necessary to supply the whole market with sugar. One of the first illustrations of the part which this industry is destined to play in the development of the country's commerce is to be found in the fact that Chicago department stores are already drawing their supply of sugar from the Nebraska beet factories, and have become entirely independent of the sugar trust and of the system of factor's agreements by which the wholesale grocers help the trust to maintain its monopoly.

This is a very instructive example of the impossibility of successfully defying the operation of the natural law of competition in trade. It is a little over ten years since one firm in this city sold at a profit for export at least 100,000 tons of standard granulated sugars. It had by that time become evident that there was nothing to prevent sugar being sold as cheaply in this market as anywhere in the world, and that in a few years the owners of antiquated refining plants might be compelled to charge them to profit and loss. To stave off a result which, in the nature of things, was inevitable, the original Sugar Trust was formed under a deed dated August 16, 1887. The first form of combination had to be abandoned after the decision of the New York Court of Appeals in the case of the People against the North River Sugar Refining Company. On the publication of this decision, in June, 1890, the trustees and holders of certificates in the original Sugar Trust took the necessary legal proceedings for a reorganization, and the American Sugar Refining Company was incorporated under the laws of the State of New Jersey with a capital of $50,000,000. The initial weakness of the combination was not cured under the plan of incorporation, and it was somewhat aggravated by the inclusion of the Philadelphia refineries in the trust and the consequent issue of an additional $25,000,000 in common and preferred stock. The plants that were shut down and the machinery that was left unused, while still drawing their proportionate share of the profits of the business, would have had to be abandoned entirely under any system of normal competition. As it was, the whole business of the combination was carried on with plants worth $10,000,000, against which had been issued $10,000,000 of 6 per cent. bonds and $75,000,000 of stock.

The Philadelphia refineries were taken into the combination to neutralize a competition which had reduced the refining margin as low as 60 cents per 100 pounds. Since this consolidation was formed, in 1891, the difference between the prices of raw and refined sugars has ruled between $1 and $1.25. But if there were a profit on refining carried on by the aid of the most improved appliances and according to the most economical methods, on a margin of 60 cents, there must be a very tempting profit on a margin varying from 70 to 100 per cent. more than this. That of itself was sufficient to tempt new capital into the business, and production would have been overdone, as quickly and surely as it would have been under like conditions in the woolen or cotton industry, but for the combination formed between the sugar refiners and the distributers of their product, the wholesale grocers. The aim of the parties to this agreement between manufacturers and jobbers was to establish a boycott against any wholesale or retailer who handled sugar competing in price with that of the trust, or who attempted to cut the prices established by the trust. The combination has, so far, remained intact, because of the impossibility of any dealer in sugar being able to count on a steady supply outside of the product of the trust, or of the refineries which have accepted its rules as to price and distributers' profits.

Now, however, this combination is menaced from three separate quarters. Here, in the East, two new and well equipped refineries which are to be run on absolute independence of trust methods are approaching completion, so that the union between the trust and the wholesale grocers is in danger throughout all the territory where it has proved strongest. However well disposed the wholesale grocers may be, as a body, to live up to their agreement for the sake of securing a fixed rate of profit, they will be compelled to trade where they can buy most cheaply, under penalty of having some competitor take their business away from them. And then, on the other hand, the trust cannot well continue to guarantee the jobber his present profit if it has to cut down its own. The second quarter from which the trust is attacked is by the competition of the Louisiana sugar houses which treat the cane grown in their immediate vicinity. Several of these are producing a fairly high grade of refined sugar which not only impairs the hold of the trust on the chief Southern markets, but is coming into competition with it in parts of the West as well. Finally, there are the beet sugar factories, whose construction seems to be fairly keeping pace with the enormous development in the beet culture. It has taken the American farmer some time to learn how to grow the sugar beet to the best advantage. But throughout considerable sections of the country the difficulties of this form of intensive horticulture seem to have been fairly mastered, and beet sugar production bids fair to take rank as one of our important industries. As it comes to the front, the system of sugar refining, as practiced in the East, must assume less and less importance as a source of national supply, and the monopolistic methods under which it has been conducted must be abandoned altogether.—*N. Y. Journal Commerce.*

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THE SUGAR WAR—THE HAVEMEYERS AND THE ARBUCKLES STILL AT IT.

New York, Feb., 1898.

The fight that is going on between the Havemeyers and the Arbuckles in the sugar and coffee trade is a struggle of giants, and bids fair to be one of the chief incidents of the financial world.

It has only just begun. The heat of the battle will come when the rival millionaires begin to slash the price of sugar. If the two hostile camps keep up the fight, it will mean the loss of millions of dollars a year to each side, and in this merry war the public will get the benefit, just as it has in the reductions of coffee, which have brought the price of that article down nearly one-half in the last two years, or from 15½ cents down to 8½ cents a pound.

They may put the price of sugar down to a level which all attempts to legislate against the trust have failed to bring about, just as the price of coffee has been brought down to a basis where there is alleged to be little or no profit in it to either of the hostile companies, although it is admitted that there used to be a profit of from 100 to 156 per cent. before the war began.

A few figures will show what the cut of one-half cent a pound in roasted coffee, which was announced on Monday, means. The Arbuckles handle about 4000 cases of coffee, of 100 pounds each, a day. This means a reduction of $2000 a day in their profits. If the yearly output amounts to an average of 3500 cases a day, or 1,050,000 cases a year, a reduction of one-half cent a pound in roasted coffee would mean a reduction of $525,000 a year in their profits.

The time was when there was a profit of from 3 to 5 cents a pound in roasted coffee, but now both sides are very reticent about the amount of the profits, and hints are dropped that there may be a loss in the business. All of the recent reductions have been made by the Havemeyers—or, to use the name of the coffee roasting company which they use as the medium of their onslaughts in the coffee trade, the Woolson Spice Company of Toledo, which they secured control of in December, 1896.

Owing to the fact that the Woolson Spice Company does a smaller business than the Arbuckles, and does not need to carry such a large stock, it can more readily take advantage of a falling market in green coffee.

The Arbuckles are keeping quiet and their friends say that rumors of compromise are unfounded. They are in it to stay. This is their consolation, that when their 3500 barrel sugar refinery is finished they will be able to do much more damage to the sugar trust with its output of 35,000 barrels a day than the Havemeyers are at present able to do the Arbuckle coffee plantation.

This is the way the Arbuckles are said to figure it: Every reduction of a quarter of a cent in refined sugar means a loss of say 60 cents a barrel. Reckoning 300 working days, this would mean a loss of more than $6,000,000 a year to the sugar trust.

If the Arbuckles turned out only one-tenth of that amount a year their losses would be only one-tenth as great. The Arbuckles, it is said, will be satisfied to manufacture refined sugar at a very small profit, but every quarter of a cent which they compel the sugar trust to reduce its price below its usual prices means, of course, a reduction of its usually large profits.

The Arbuckles have the support of Claus Doscher, who is also building a large sugar refinery in Brooklyn. There are also other outside refiners with an output of 10,000 barrels a day, so that when the new establishment starts up the outsiders will have an output of something like 18,000 or 19,000 barrels a day, compared with 35,000 or more by the trust.—New England Grocer.

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THE TORONTO TAXING SCHEME.

The Retail Merchants' Association of Canada has long been at work devising a plan for levying a tax which, if enforced, would prove a remedy for the department store competition. It is based on the theory that if a party desires to do all the business he should pay the tax. In looking into the present method of levying taxes on personal property many inequalities were found and many instances where erroneous statements were made. After considering various systems, a plan was adopted called "The Retail Merchants' Turn-Over Business Tax," and which imposes a tax based on the volume of business. The tax is increased as the amount of sales are increased. A dealer selling under $50,000 per annum is to be taxed one-eighth of one per cent., or $1.25 for every thousand dollars of sales, or $62.50 on a $50,000 business. The rate is raised one-eighth of one per cent. for every increase of $50,000 in sales, so that a store selling $1,000,000 would be taxed 2½ per cent., or $25.00 per thousand dollars of sales, equal to $13,125 yearly tax.

In a circular explaining this plan the association says:

Under the business tax the volume of business alone will be required and known only to the assessor, and no further private particulars need be given. To ascertain the volume of business, and the opportunity to evade the correct amount, may be an objection raised by some, but merchants cannot do very much business without assistants and bookkeepers, and none can afford to place themselves in a false position if they should be unjust enough to do so, knowing that others are aware of the amount of their turn-over, so that this objection need not be considered for one moment.

We believe that the merchant who sells the greatest amount of merchandise should pay the greatest amount of tax, and this would place every one on the same basis. Whether he got merchandise on consignment or bought it on credit or for cash, he would calculate a very small percentage on the sales as belonging to the city, and if he sold them he would pay; if he kept them upon his shelves he would pay nothing, and not, as now, pay taxes year in and year out upon the same goods; and whether the goods were made in foreign countries or made in our own city by our own citizens and residents, the tax would be levied equally upon all alike.

If you do no business you pay no tax; if you do all the business you pay all the tax.

If a city does no business its property is valueless, no matter how wise you think you are in estimating land values. Take away the labor and business of a city and you take away the value of a city; pass all the business through one or two hands, and let them send your money away to foreign markets, and you enrich one or two and starve the many; the city becomes depopulated, and the only purchasers left are the civil servants, the police, the post office officials, school teachers, and public servants of all sorts, all waiting to pay their last respects to a destitute city.

No merchant would accumulate a stock of goods unless he intended to sell them, and to sell them he must have customers. His customers are the public, and if he becomes rich through the public, he owes a debt of privilege to the public; and this is asked for when taxes are necessary, and in the case of Toronto just now taxes are very necessary, and he is therefore asked to pay back to the public treasury his share of what was given to him by the public.—N. E. Grocer.

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ORANGES AND LEMONS—HOW THE DINGLEY TARIFF HAS AFFECTED THE ITALIAN TRADE.

The Dingley Tariff has had an injurious effect upon the growers of Sicily oranges and lemons. Dispatches just received announce that a crisis has been reached in Southern Italy and Sicily, prices for fruit being so low in many places that it does not pay to pick the fruit. It is always the darkest hour just before dawn, however, and relief for the Italian orange and lemon growers is in sight from two sources. Negotiations have begun between the Russian and Italian Governments for mutual concessions, the representatives of the Russian Government saying to Italy: "You scratch my back by reducing your duty on petroleum 20 per cent. and I'll scratch yours by knocking 20 per cent. off my duty on oranges and lemons." In addition to this, when Jack Frost recently lunched on a majority of the California lemons he bit a hole in the cloud which darkened Sicily lemons and let through a ray of sunshiny hope. The American people cannot do without lemonade, and if the California crop is as greatly damaged as current reports indicate, where else can they get their lemons except from Sicily? A leading importer sized up the lemon situation by asking that pertinent query.

The Dingley law caused a considerable change in the orange and lemon markets. In the first place, bankers refused to advance money to growers for their fruit by reason of the uncertainty of the outcome of the sale. The new tariff act advanced the duty on lemons from 23 cents per box to about 84 cents, and on oranges from 23 cents to about 75 cents. Under the Wilson law the duty was levied according to the cubic contents of the packages, while under the Dingley law the duty is collected according to the weight. Lemons, being closer packed than oranges, weigh more; hence the difference in the duty. In order to show the effect of the present law it is only necessary to compare receipts of oranges and lemons this year and last.

In December, 1896, 47,000 cases and 44,000 boxes were received at this port, while last month's receipts were only 8,400 cases and 10,000 boxes. Lemons make a little better showing, but the falling off in arrivals has been very large, figures for the 1896 period being 120,800 boxes, against 72,200 in December of 1897. Receipts of lemons for the present month have been about 47,000 boxes, against 125,000 last January.—N. Y. Commercial America.

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THE DEMING SUPERHEAT SYSTEM OF CLARIFICATION.

Many of our readers are acquainted by name with the above system, which has now gone through a series of practical trials, principally in Louisiana, including the well-known plantations of Calumet, Palo Alto, Belle Terra, and Shadyside, also the Ewa and other Plantations in Hawaii, and estates in Trinidad, Mexico and British India, and judging from the very satisfactory testimonials received from those in charge of the technical working at the factories, has turned out a great success. The apparatus is being manufactured under a series of patents. The patentee states that it is not only the best but the first and up to now the only complete system, while its simplicity and low cost place it within the reach of all sugar manufacturers. The following description has been supplied by the patentee:

This system comprises a complete treatment of the juice from the time it leaves the mill until it reaches the evaporators, even a process for sulphuring being included whenever desired.

From the mill the juice is carried to liming tanks of large capacity, which allows ample time for the careful and even tempering.

An air compressor is furnished with these which blows a strong current of air in the bottom, and by keeping the juice well stirred prevents any settling of the mud present and insures a thorough mixture with the lime; all settling is thus postponed to the settling tanks, where by reason of its coagulated and heavy nature, it quickly and readily falls to the bottom.

The liming tanks discharge into a pump tank, which, being deeper, keeps the suction pipe of the pump constantly sealed and prevents any possibility of air entering the machine and retarding its action.

The pump forces the juice under pressure through the superheater, first through the absorber, then through the digester or high temperature heater, where it is heated to 230 deg. to 250 deg. F., and finally again through the absorber, where it is cooled down to 200 deg., giving up its surplus heat to the incoming cold juice.

A very small amount of juice is required to fill this machine, and during the operation it is under heat but forty-five seconds, being discharged at a temperature several degrees below that possible in the ordinary open clarifier system.

It then enters a series of continuous settling tanks, from which the juice is constantly decanted to the evaporators. There are no surface scums to require brushing or skimming, everything being precipitated with the mud to the bottom of the tanks, where they are drawn off at short intervals.

It is an admitted fact that a thorough settling of the suspended matter is far more efficient than any method of juice filtration. True filtration consists in regular and constant percolation escaping drop by drop, which can never be practically accomplished in any filter thus far produced on account of slight fluctuations of pressure, and especially on account of the continually varying character of the filtering surface.

Even were it possible to secure an efficient and desirable juice filter, the area necessary would be fully ten times that required by the mud presses; and, furthermore, this long and enforced contact of the juice with its precipitated matter causes it to take into solution a great many impurities, and although the filtered juice appears bright, it contains more impurities than juices which have been properly settled, and therefore produces less sugar and of an inferior quality.

In the continuous settler system this is not the case, for the natural currents induced cause the juice and the mud to be continually and rapidly flowing away from one another.

The juice containing all the precipitate must enter the cone bottoms of the continuous settlers, where the mud, which is heavy, remains until drawn off for filtration, while the juice merely ascends and escapes clear at the surface.

The two materials thus being removed from opposite ends of tanks, as they should be.

The juice leaving these settlers contains but an infinitesimal amount of cane fibre that remains in suspension and will not settle. This is pure fibre and contains no impurities of any kind that can retard crystallization, nor can it in any way injure the quality of the sugar or interfere with the centrifugal work.

Cane juices are darkened by the use of lime in proportion as it is used, the least lime the less color, and the less injury to the quality of the sugar.

The Deming system uses but one-half to two-thirds the amount of the lime required by the open process, because lime more readily combines with cold juice, and the instantaneous application of high heat increases the action of the lime during the process of clarification. No unabsorbed, unslackened lime is found on the liming tank bottoms, as where lime is applied to heated juices in the open system.

In the open clarifier system there occurs great losses of heat by radiation from the liquor's surface and the exposed sides of the tanks, and also by evaporation during the process of heating and skimming.

The evaporation of one pound of water requires seven times the heat necessary to bring it to the boiling point, or the evaporation of but 14 per cent. from the surface of an open tank would suffice to bring the whole tank to the boiling point.

Evaporation in open tanks is not economical, as it is accomplished by the use of the boiler steam, when it could better be done by exhaust steam in multiple effects.

The extensive lines in piping about open clarifiers present many opportunities for leaks and consequent waste of heat. The escaping vapors from the open system containing acids given off by heat are very destructive of buildings and machinery.

The Deming system heats in closed vessels, well covered with non-conducting material, no surface exposed and no evaporation, and the solutions are discharged at a temperature below boiling, but one steam inlet and one drip line. The use of steam for heating is constant, not intermittent, as with the open system. The economy of the Deming system is at least 25 to 33 per cent. over the open system.

In operation the Deming system is nearly automatic, one man easily operating all parts, working any quality of cane per day—the saving in labor often exceeding 10 per cent. on a sum twice greater than the total cost of the system.—Sugar Cane.

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SOILS AND THEIR TREATMENT.

(From Prof. Person's Bulletin on Typical Florida Soils.)

INSTRUCTIONS IN USING LIME.—When soils are of an acid character, such crops as clover, alfalfa, and certain other leguminous plants which under proper soil conditions, have the power to utilize the nitrogen of the air existing in the soil, are unable to make a satisfactory growth. Moderate applications of water-slaked lime under such circumstances will prove highly beneficial in sweetening such soils and promoting nitrification. Often, injury results from the application of lime in a caustic state. When applied in this form, particular care must be exercised to avoid excessive applications, even on soils where crops requiring a relatively large lime nourishment are to be grown. Next to the water-slaked, air-slaked lime is the most satisfactory form in which to make lime applications. On thin, sandy soils deficient in lime, from 500 to 1,000 pounds, per acre, is the proper quantity to apply. On heavy soils these quantities should be increased about one-half. It is generally best to make lime applications sometime in advance of planting. Autumn applications are generally to be preferred. It should be distributed with great uniformity and carefully plowed and harrowed into the soil, otherwise its beneficial effects will be greatly retarded. On soils needing this material, about every four years would be the proper interval for administering lime dressings to soils. Lime should, immediately after being applied, be harrowed into the soil, otherwise it will likely cake, and this would detract from its good effects.

Lime may Promote Fungus.—Unfortunately, it has been found that lime is conducive to the growth of the potato scab fungus. Hence, when it is applied to soils to be employed in cultivating this tuber, either separately or in a crop rotation, it should be applied in very moderate quantities. Before planting, the seed-tubers should also receive some germicide treatment, either corrosive sublimate, formalin, or other appropriate one. Corrosive sublimate is very generally used with good effect. It is intensely poisonous and should be handled very cautiously. Discarded solutions of it should not be thrown out around the premises in reach of fowls or to find its way into the well. Corrosive sublimate can be easily procured in the form of small white crystals at any drug store. To prepare a germicide solution of it of proper strength, dissolve two and one-fourth ounces of these crystals in several gallons of hot water in a suitable barrel, and subsequently make the solution up to fifteen gallons by the addition of cold water and stir thoroughly. The same solution may be used over and over again, but should be kept carefully covered to prevent access to it by fowls, etc.

The seed-tubers after being washed, and without being cut, may be placed in a sack and immersed for an hour and a half in the solution. They will be uninjured for planting by this treatment, while their susceptibility to this fungus attack will be very greatly diminished. A solution of the above strength will not injure the hands but it should not be allowed to enter the mouth under any circumstances.

MURIATE OF POTASH.—Among the different sources for obtaining potash for fertilizers, muriate of potash is most common. This is partly because it contains potash in concentrated form, averaging about fifty per cent. and also, because, as muriate, the material can be purchased somewhat cheaper. A reason for the latter is found in the fact that, on account of chlorin being one of the constituents of muriate, upon certain crops, such as tobacco, potatoes, sugar-beets, etc., it is known to exert an unfavorable influence upon their quality. On account of its cheapness, where it will exercise no deleterious effects on either the soil or crop, it will, of course, be desirable to employ the muriate as the source of potash, but under the conditions above noted, as well as under certain others now to be mentioned, the potash supply should be provided in other forms.

It has recently been observed by Prof. Goessmann of the Massachusetts Station that upon soils having compact subsoils, and upon those which are not well drained, and in which the supply of lime is small, the continued application of muriate of potash may prove quite injurious. Under such conditions as are noted above, a chemical change occurs between the lime of the soil and the muriate, whereby the chlorin of the latter unites with the soil lime, forming calcium chlorid, an objectionable compound possessing poisonous properties to plants. Fortunately, this compound is easily soluble, and if the land is well drained it will readily pass from it, but, under the conditions noted above, its presence might prove highly injurious. Goessmann observed that such crops as oats, soja beans, etc., grown upon a soil which had received a continued application of muriate of potash for a number of years continued to decrease in yield year after year, and finally he became convinced, by experiment, that this decrease was due to the effect of the muriate of potash on the lime of the soil. A part of the chemical change referred to above is, that the potash is, in turn, converted into a less soluble form, which really is desirable, because less of this material is then likely to be lost by leaching; but it should be remembered that this change always occurs at the expense of the time. If the supply of lime is abundant in a soil no serious results are likely to follow from the use of muriate in a favorable season, but, under the circumstances noted above, its use may prove injurious.

The employment of the muriate is safer upon a deep soil with open sub-soil, because in a soil of this character the poisonous lime compound formed passes readily out of the reach of the plant.

In all cases where the continued use of muriate would prove objectionable, sulphate of potash may be substituted in its stead, and the objections above noted will not apply to this material.

Soils are of an Acid Character.—It is a very easy matter to ascertain whether or not a soil possesses acid properties. Soils that contain much carbonate of lime are of an alkaline character, (i. e., directly opposite to acid). Such soils, of course, need no liming. But when a soil is distinctly acid, as is often the case, particularly with muck soils, additions of lime are always desirable. In order to determine acidity, a very simple test will suffice. Employ a narrow strip of blue litmus paper, an inch and a half in length, (to be had for a trifle at any apothecary shop) in conducting the test. A few ounces of the suspected soil may be placed in a glass and made into paste with water by stirring with a rod or stick. Allow the paste to stand for a half hour, and then with a knife blade separate the paste, and insert the strip of litmus paper and press the moist soil against it with the blade, and allow the paper to remain in this position for about five minutes. Remove the paper and see if the end placed in the soil has changed from the original blue color to red. If such a change has occurred, it proves that the soil is acid, and that an application of lime will usually prove beneficial. The end of the paper to be inserted in the soil should not be handled because often such handling will produce a red coloration of the litmus, and without proper precaution is exercised, this change might be ascribed to the soil. See that the end of the paper applied to the soil is distinctly blue when inserted. Blue litmus will invariably be changed to red by acid soils, and red litmus to blue by distinctly alkaline soils. Faintly alkaline soils will be neutral to test paper.—Florida Tropical Agricultural.