

THE  
PLANTERS' MONTHLY,

PUBLISHED BY THE

Planters' Labor and Supply Company.

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VOL. I.

OCTOBER, 1882.

NO. 7.

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*FORESTRY.*

The subject of tree planting and the preservation of forests is now occupying more general attention than ever before. It has become a regular science in many countries, fostered by governments, and taught in departments of colleges; schools are established for it with regular courses of study and instruction. It is not very long since the idea that trees—more especially aggregations of trees into forests—had any influence on climate, the health of communities and rain-fall, was received with doubt if nothing more. It may be that the disciples of forestry in some cases are over enthusiastic, but that the preservation, and growth of forests is of great importance, and that the presence of large bodies of trees has a wide-spread and beneficial influence over many diverse interests in a country is now an established fact. A writer reviewing the forestry work done by the tenth census of the United States says: "The trees are the kindest friends of the soil; they are the guardians of its fertility; they protect the fields from devastating floods and cherish the springs that feed the streams. Without them a land becomes an arid desert and its people are debased to poverty and barbarism." Stronger language could hardly be used, yet the author of those sentences is a man of wide learning on the subject, whose opinions are worthy of attention because they are results of extensive research. Immense tracts of desert in Asia and Africa near the Mediterranean Sea were once blooming gardens and fertile fields, yielding both beauty and food for many thousands of people. The cause, and apparently the only cause, for this wide-spread ruin is the entire denudation of the forests of the country.

There are not yet facts sufficient to indicate what proportion of the United States are covered with forests, the results of the last census not yet being published, but it is worthy of note that the scourge of grass-hoppers, of extraordinary droughts, of tornadoes and cyclones, which result every year in the ruin of vast amounts of property, are confined chiefly to that portion of the country where forests do not exist and where for many miles not even a solitary tree can be seen standing. Much has however been done in the last few years in the way of tree planting on the prairies of the west, and it is not too much to expect that even the present generation may witness marked climatic changes, having their origin in the introduction of forests.

Although the climatic effects may perhaps be regarded as the most important of forest uses, yet they are by no means the only ones. There are very many other uses, chiefly that of fuel and for wood to be used in building and manufactures. The vast majority of mankind to-day use the wood gathered from the cuttings and trimmings of trees and from felling of forests as fuel. Wood is still the material used in the construction of more than one half of the houses and habitations of the human race, and it is difficult to say what should replace this for more than half of mankind.

Arboriculture, the protection of forests, and training schools for this purpose, have been carried to a considerable degree of proficiency in Europe. Nearly every country has its schools and conservatories, a course of several years is insisted upon, part of which time is spent in practical application of principles learned. On graduation the pupils stand in order of promotion in the service of government in forestry work. In forest science Germany takes the lead and it is eagerly followed as a profession.

In Russia about 23½ per cent. of the country is occupied with forests. Austria has about 31½ per cent. Hungary 28½ per cent. France 15½ per cent. Denmark 4½ per cent. and Great Britain only 3½ per cent. The latter however, suffers very little from lack of forests, owing to the position of the British isles receiving the vast volume of the Gulf Stream on its western shores, whence arises its humidity and soft climate. Forest Legislation in France first appears in the 16th century, but in spite of that and frequent enactments subsequent thereto, reckless destruction of forests continued till a very recent period, to which a renewed impetus was given by the French Revolution. The ruin and desolation caused in the valleys of the Rhone and Saone by the cutting off of the forests is historical. But much of the desolate region where forests once stood, has been replanted and thousands of acres of land restored to tillage purposes. Pines have been planted in the white shifting sands of Gascony, retaining them in place, causing moisture sufficient to produce the growth of grasses whence has come pasturage enough to support a series of dairy farms. This forest which was wholly planted is about 150 miles long and from two to six wide.

No inconsiderable revenue is derived from these cultivated forests, arising chiefly from the annual cutting. In 1827 the amount derived from the

French forests was about 27,000,000 francs, in 1879 to about 35,000,000. In Scotland the forests owned and cultivated by the Earl of Seafield permits of cutting off about 1,000 acres annually whence a fine revenue is derived.

No country in Europe has suffered as has Spain from the reckless and wholesale denudation of forests; a cause in the minds of some thinkers, of her present insignificant position among the powers of Europe. India and China have also suffered from this cause, beyond the power of man to compute in the absence of authentic statistics. But in India much has been done under the foresight and energy of the British government to repair the evil. The forest service is one of the governmental departments, and owing to what has been done, the forests have not only increased in area, but in the variety and character of its woods. To-day a large revenue is derived from the exportation of caoutchouc, (India-rubber) Shellac, lac-dye, Sandal-wood, Teak, Catechu and now Cinchona, the first and last named, as appears by their names are not indigenous, but have been brought from South American woods and in their new home have more than repaid for the labor and expense of a long ocean transfer.

Considerable space has been devoted to a rapid review of the field in some parts of the world. Nothing has been said of South America whose virgin forests still excite the wonder of the world for their vast extent and richness, both in timber and various gums, spices and fruits. The object has been to direct attention to the importance of the subject before applying it to our own little state.

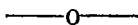
The indigenous trees of the Hawaiian Islands are remarkably barren of fruits, gums or spices, but there are several varieties of handsome cabinet woods besides a few of great foliage beauty. On Maui and Hawaii, more particularly the trees attain a large size and great height. As shade trees, for fuel and some cabinet and other purposes they are useful. But who, that has lived here for twenty-five years or even less, has not observed the immense destruction which has taken place in our limited forests? The loss from cutting has been small compared with what has been destroyed by cattle and other animals. It has been urged that the koa and kou have been killed by a worm hitherto unknown. Perhaps so, but it is not improbable that the work of cattle, horses and goats made a place for the operations of these little animals. In many places the dry beds of streams, where now only the floods of the rainy season come tearing down with ruin and desolating power, were once occupied with perennial waters distilled through the whole year. When the writer of this first began to attend Punahou school in 1860, water flowed the year round in the Makiki ravine. The upper part of Makiki valley, all of the high lands at its head, Tantalus, and nearly all of Sugar-loaf were covered with a dense forest growth. Manoa was then the region of continuous rains. Nuuanu, Pauoa and Kalihi valleys and the adjacent mountains were thickly covered with woods, the ground was a heavy mass of ferns and under-growth. A

visit to the woods in those days, at any time in the year, meant soaked and torn clothing and ruined boots, every gulch had its little stream gently trickling to the valley below where flowed a strong pure stream of sweet water, over-hung and hidden beneath a wealth of richest vegetation. From the mountain peaks, glimpses of the plains, valleys and the ocean, could only be had by climbing to the tops of trees or breaking away the ferns and vines over-hanging the precipices. The notes of birds only broke the impressive silence. Contrast with this the region back of Honolulu of to-day. The valleys and hillsides almost wholly denuded of trees, the water-ways dry and rocky, except when filled with torrents of muddy water from the winter rains, great rifts torn from the mountain sides where land-slides have ripped away the very bowels of the hills and lodged at the bottom a mangled mass of rocks, sand and earth, with a few dead roots and stumps, the clouds of dust whipped and borne fiercely by the winds from the crests of the ridges and mountain summits and the higher peaks rising clean and hot into the air, rarely covered with the cloak of sheltering clouds which used to be so constant and heavy. The water supply of to-day is impure and capricious as compared with that of twenty and thirty years ago. To say that all of this has no connection with the loss of forests is certainly a bold assertion. Who does not remember Waimea, Hawaii, of old, and the Waimea of to-day? The vast forest which stretched its unbroken wall of green from far up the sides of Mauna Kea across the valley and over the Kohala mountain into Kohala, a break-wind for the verdant plains of Waimea is gone. To-day from the high ground near the Church, the eye wanders wearily over the desolated plains, caught only by the clouds of red dust, marking the spot where a herd of cattle or horses wend their way in search of feed or the furious wind sweeps the loose soil into the air. "Mud Lane," once the terror of travellers from Kawaihae or other parts of west Hawaii, into Hamakua, no longer causes fear; its hitherto unknown depths now afford a solid footing. Kona, Kau, Kohala, even rainy Hilo, know droughts and water-failures heretofore unknown. Maui, Kauai, Molokai, Lanai are all equal sufferers, Kahoolawe is sometimes looked upon as past recovery. Its clouds of red dust make a lurid picture far at sea.

The causes of all this change and destruction have been largely under the control of man and because they have been unchecked and disregarded the ruin has gone fiercely along. Undoubtedly there have been meteorological influences at work over which mankind with its present knowledge has no power, but the preventable causes are what we are on trial for, and for which we must almost universally be found guilty. How rarely is one found who plants a tree to replace one cut down. How few have set out trees for the sake of forest growth. What small attention has been paid to the introduction of valuable woods to our forests from other lands. Though not strictly in the province of this article, yet the question constantly recurs, why is it that so few fruits have been introduc-

ed which might do well with us. Why are oranges continually at such high prices? It is almost true that what Hawaii produces naturally can be bought cheaper in the cities of the United States, where they will not grow. The fact is, that no attention, with a few exceptions, is paid to anything except sugar and rice. There have been some exceptions. Captain Makee at Ulupalakua and Honuaula, planted many thousands of trees which now stand, a splendid monument to his memory. He planted fruits, and those who have eaten of his apples, figs and other luscious fruits can testify to the success of his enterprise. From the Alexanders and others at Makawao, we find that grapes and the berries of temperate climes will do well. The Lihue plantation has a corps of foresters whose labors already begin to show. But all which has been done is but a tittle of what the country demands. Some of the money that will go for empty show might be far better spent in experiments in the introduction of new and valuable woods and plants. There is no time like the present for such work. It might much better have been commenced twenty-five years ago, on a systematic and comprehensive scale. By which we do not at all intend to disparage the valuable work done by Hillebrand, Montgomery and others. Such work can only be done by long and careful experimenting and under a wise and comprehensive system. The government ought to take the matter in hand and push it steadily forward. There should be a plan and action which ought to survive short-lived administrations. In addition to the introduction and fostering of useful woods and plants from foreign countries, we ought to know what we have in our midst. There are many of the native woods, fibres, herbs and plants of great value; but they are little known, and are passed by for those of foreign extraction. One need only look at the gardens of our towns and country to see that the native plants and trees are ignored for many of far less beauty and value.

The subject grows as one writes and thinks of it. There is room for a library of information on several branches of the subject. They all deserve more attention than they have received at our hands.

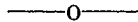


In our last number we stated that the Government could not be relied on to supply the demand for labor. Events which have since taken place strengthen this position. After refusing to endorse Mr. S. T. Alexander as labor agent to Japan, and after refusing Mr. C. Spreckels' offer to represent the Hawaiian Government in Japan in immigration questions, or procure the services of Mr. C. W. Brooks for the same mission in case of his own inability to go, they have finally started off Mr. John Kapena to Japan with Kaulukou as secretary of legation. Mr. Kapena is a man whose health is broken down and whose habits are such as unfit him for a mission of this kind even if he had the ability which he has not. His secretary is utterly inexperienced as regards the demands which ought to

be made upon him. This, with the circumstance of the waiver by the Government of the cost of passage of the female immigrants by the *Hansa* which cost the planters had contracted to pay and were prepared to pay, is strong evidence that the present Government regard the Bureau of Immigration as a contrivance for the convenient exercise of patronage, rather than a system for the re-population of the country and the introduction of labor.

If we are correct in this surmise it becomes the planting interest to make some practical arrangements for procuring labor independently of the Government, that this great demand may not rest for its supply upon official caprice or incompetence. What may be the prospects of Portuguese immigration, we have not been informed. It is probable that the set-back which the system that had been inaugurated, has already received from the present Ministry, will cause serious delay at best. In the mean time it will be well to draw so far as possible from other available sources. We are informed that it is a practicable thing to introduce laborers from among the German Peasantry; the expedition to Japan has yet to be heard from, and may open up a field of supply in that direction; in the mean time it might be useful for the Planters' Company to have a representative in Japan, who would be able, perchance, to assist Mr. Kapena in his efforts there. The past experience with natives of the Micronesian Islands has not been entirely satisfactory, yet there are some employers who think well of them as laborers. The experience we have already had in procuring them would be of advantage in case of new expeditions to that field.

The Planters at their present meeting certainly have a better basis of discussion upon this important subject than ever before. Their information is wider and their experience larger.



#### SUGAR CANE IN KOHALA.

The average yield of *Plant Cane* for the District of Kohala is about 3½ tons per acre: it costs the Planters about \$100 per acre, by the time the same is delivered at the mill, or say \$30 for every ton of sugar made; the same (acre) costs the mill owner not more than \$75 or \$80 to convert into sugar. My estimate is based on the fact that the mill to which I haul my cane has always a crop of over 1,200 tons per annum, the current (or yearly expenses) not at any time exceeding \$25,000 exclusive of interest which I would say might be figured at near, and say 15 per cent. on an outlay of \$60,000, or \$7,500 a year added to the actual cost of running the works, brings the total of \$32,000 for the work of manufacturing the beforementioned 1,200 tons of sugar, *i. e.* a trifle more than \$27 for every ton of sugar made, and, in giving these figures, I have omitted to state the Planter, though he has produced his acre of cane at a cost of \$100, has not included the interest on his horses, cattle, buildings, agricultural implements, wagons, in fact everything that he finds necessary to carry on his works as a planter.

## COMMUNICATIONS.

*DOUBLE AND TRIPLE EFFECT.*

EDITORS PLANTERS' MONTHLY :—I have been frequently asked, as a planter who has a double effect in his sugar house, numerous questions in regard to its operation—and which would be most preferable for our Hawaiian sugar mills—the double or triple effect.

I am not aware that an actual experiment has been made on the Islands, to ascertain which apparatus would evaporate the most water in a given time, with a given pressure of steam, the pressure of steam being sufficient to boil a triple effect to advantage. These experiments have been tried in other countries, I believe, and show an advantage in favor of the triple effect. But I say without hesitancy, that for works constructed as our works usually are, with high pressure engines, the double effect is the most preferable and economical. Where compound engines are used, as at Spreckels' plantation, on Maui, it is possible the triple effect may be the most economical.

The vacuums in the double effect, while in operation, are usually 1st pan 15, 2d pan 26. while in the triple effect the vacuums are 1st pan 5, 2d pan 15, 3d pan 26, so that it is evident that the double effect will work well with steam at a much lower pressure than that required to boil a triple effect, owing to the fact that the vacuum in the first pan of the double effect, where the steam is turned on, is so much better than the vacuum in the first pan of the triple effect, and consequently the boiling point is reached much sooner in the double effect. This is a very important point in favor of the double effect, for plantations that wish to use their exhausts for evaporating the juice. The double effect will boil well with the exhausts from the various engines of the mill and if it has a large enough capacity for the work required, it will with these exhausts alone, do all the evaporating for the "works," reducing the juice down to a proper consistency for the vacuum pan. Moreover it is by far the best way to use exhaust steam yet adopted here, as it acts as a condenser for the engines, and really assists them in their work—the pressure of steam in the exhaust pipes, often being reduced below atmospheric pressure, by the condensing effect of the drum of the first pan.

Now, triple effect will not boil well with the steam at the low pressure of our ordinary exhausts, it requires an additional pressure, which would have to be obtained by the use of a little live steam, or by increasing the back pressure on the exhaust pipes, which would interfere with the proper working of the engines throughout the mill, and be very undesirable.

I therefore conclude, that as the double effect will do all the evaporating required, with nothing more than the exhausts from the engines common-

ly used, and is by far the best way of utilizing the exhaust steam, in that it relieves the engines of all back pressure, it meets our requirements better than triple effects can.

The pans of our double effect are 12 ft. deep by 6 ft. diameter, with two steam drums, that together contain 1,000 ft. heating surface. It will, with exhaust steam, evaporate in 10 hours, enough juice to make 8 tons of sugar, with the steam at atmospheric pressure. In order to do more work, we are obliged to carry the steam at a higher pressure. This is the amount of work that our double effect will do the most economically, thus showing that it is well to have the pans and steam drums a little larger than the sizes usually recommended. By increasing the amount of grinding, naturally, an increase in the volume of exhaust steam follows, and we find that owing to the limited amount of heating surface in our double effect, this increase in the exhaust steam is not absorbed or taken up so to speak, rapidly enough to keep down the pressure, and thus relieve the engines. There should, therefore be a corresponding increase in the size and heating surface of the double effect. We have now used our works for over two years, and used for fuel nothing but the trash from our mill; and it is but fair to say that this trash is so completely pulverized by our mill, that it is much poorer fuel than the trash found at most mills.

H. P. B.

EDITORS PLANTERS' MONTHLY.—You have, in your last two issues expressed a wish that all those engaged in cane culture should forward to you anything that might be of interest to those who peruse the columns of your very valuable journal. I have not, at present writing, much to offer, though my purpose is, from month to month, to contribute something that I trust may be of interest to those engaged in cane raising. As a planter, I have long felt the necessity of an organization such as now exists, and I am glad to know that such an institution is now in full force, and hope too, that the purpose for which it was inaugurated may be more than sustained. We are laboring (though the treaty is on our side for a year or two) under a great disadvantage, that of labor, the planters generally, have to pay more than double that which is paid in other sugar producing countries, and we may be very sure, that if our yield was not far above the average of other parts of the world our ruin would be absolute. I am willing to concede the fact, that a planter can make money by planting on one half shares, but certainly do not see how this is to be accomplished if wages are to advance in the same ratio as they have the past two years. It is not wise for any of us to *count* on a continuance of the treaty, on the contrary, we are foolish if we do not make our reckoning apart from it, and that being so, I cannot see how any planter receiving one half the sugar can make any money as things are now. Under the protection of our treaty we are all right, but let it be abrogated and those planters who have made the contracts on one half shares are certain to (unless out of debt) go to the wall. Our only remedy therefore is to get labor at the same price as that paid in other parts of the world for the rais-



ing of the same crops. We must have it, and we feel that we shall get it through the Planters' Labor and Supply Company. In the mean time we are very heavily handicapped and working to a very serious disadvantage; the planters in my opinion, ought to have two-thirds of the sugar. I am aware, however, that we have only ourselves to blame for making such contracts, and can simply abide the time that will bring an end to our agreements, and then, well, the planters will either compel the mill-owners to sell, to incorporate, or failing these they will erect mills of their own, or they would be induced to accept a fair division of the profits. As the matter at present stands, it is \$150 for the mill-owner, to \$100 for the planter.

Faithfully yours,

THOS. J. HAYSELDEN.

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### *THE CANE BORER.*

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Almost every agricultural product has its enemies, which attack it for two purposes; that of sustaining life, by consuming such parts of its fibres as are most nutritious, and for providing a safe retreat for the propagation of its species. Thus the cotton and the tobacco plants have their destructive worms. The coffee and orange trees have their parasites in the form known here as the "blight." The apple, pear, peach and other fruit trees have their pests, either worms or beetles, which attack and destroy both the tree and its fruit. The sugar cane, here and in other countries, has its enemies, the black, brown, gray and green caterpillars, and the beetle known as the "cane-borer." While it is well for planters to study the habits and natures of the enemies of sugarcane, the better to guard against their ravages, if it be possible, I wish at present to speak only of the "borer," which has been quite destructive on some of our plantations. It is my belief that this insect is identical with the "apple tree borer" of America and the "cane beetle" of Louisiana, and I infer this from the descriptions given of them in foreign periodicals. The following describes the apple tree borer:

"The perfect insect makes its appearance the last of May or early in June. In the day-time it is found among the leaves of the tree, flying only at night, when it lays its eggs, one at a time, usually in the bark of the trunk of the tree near the ground, and sometimes, when the insects are numerous, or when they are prevented from depositing their eggs near the roots of the tree, they will resort to the axils of the lower limbs. When the grub is hatched it makes a burrow under the bark, where it lives for some time, and afterward makes a channel upward through the wood for several inches, and usually completes its work as a larva at some point near the bark and directly above the place of entrance. Here it undergoes its final transformation into the perfect insect and digs its way out through the bark. It remains in the larval state two or three years. If the outer bark is scraped from the tree in places where the eggs are likely to be deposited, in the latter part of August or first of September, a small dark

patch will indicate the position of the newly-hatched grub. In a later stage of its work the little heaps of sawdust-like particles that have been thrown out from its burrow, and frequently cover its lower opening, will indicate the position of the ravages of the insect in the body of the tree."

No remedies like those practiced in the United States to destroy these insects—such as using alkalies, whale oil soap, or digging out the grub with a knife—can be of any use here in our cane fields. The best if not the only effectual remedy is to burn off the trash after harvesting, which will destroy the eggs and young insects, that may remain in the stalks and stubble; and where the burning is very thorough the borers seldom trouble the cane the following season.

The *American Naturalist* (a periodical with which our PLANTERS' MONTHLY should exchange,) has the following relative to this destructive insect in Louisiana: "One beneficial effect of the Mississippi floods is that the planters of the Teche Country will, in all probability, be free for a number of years from the attacks of a beetle (*Lyrrus rugiceps*), which has of late years proved very destructive to the sugar cane there. It will, undoubtedly, have been drowned out by the months of submersion which the fields of the infested region have suffered."

The Hawaiian cane-borer is a small beetle, measuring from a half to nine sixteenths of an inch in length, the wings slightly striped, and the head armed with a curved proboscis or borer, about three sixteenths of an inch in length. All that I have seen have been about the same size, though the hole which they bore in the cane stalks is nearly as large as an ordinary lead pencil. Sometimes the hole extends the entire length of the cane stalk, from the ground, and once in the stalk, the insects do not leave it till cut.

H. M. W.

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#### CLARIFYING CANE JUICE.

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PAIHIHI, Maui, Sept. 20, 1882.

EDITORS PLANTERS' MONTHLY:—At your request I send the following account of the method of clarifying cane juice, practiced in the Haiku mill No. 2.

The juice first passes through a fine brass strainer, and is then conveyed by means of a pump and troughs to one of the clarifiers. When a quantity sufficient to cover the two rows of copper pipes has been collected, heat is applied by means of exhaust steam from the engine, and a scum immediately commences to form on the surface. When the clarifier is nearly full, exhaust steam is shut off, direct steam applied, and milk of lime, at a density of 10° Beaume, is stirred in. In about five minutes afterwards the juice begins to break through the scum in spots, and when this has taken place over the greater portion of the surface, steam is cut off and the contents are allowed to settle for fifteen or twenty minutes. Then if the liquor is examined in a small glass vial, it should appear trans-

parent, free from particles, and should test slightly acid. It is drawn off through cocks near the bottom into the cleaners, where by means of heat and sweeping, the clarification is continued for about fifteen minutes, and finally completed, after evaporation, by subsidence in tanks for several hours.

When the juice ceases to run clear from the clarifiers, the residue, amounting to about 12 gallons, is run through a cock flush with the bottom, into a tank, and returned at once, by means of a pump into another clarifier, and the first one is washed out.

Instead of the deep sweeping pans, I should prefer the long, shallow, sorghum pans, now so much used, believing that it must be easier to lift dirt through ten or twelve inches than through thirty inches. By this method of clarifying, juice is prepared for evaporation in about one hour, and with only one man at the clarifiers. Forty a day can be put through, whereas by the method of skimming it would be harder for two men to do the same work.

More than a year ago, it occurred to me that salicylic acid might be useful as a clarifying agent. I have since experimented with it, but have not been able to use it as a substitute for lime in the clarifiers. I have found, however, that by putting one ounce of the acid, dissolved in half a gallon of hot water or juice, into every three hundred gallons of molasses, before running it into coolers to crystalize, fermentation is prevented and more sugar produced. Hence, I never use lime except in the clarifiers, and then not enough to entirely correct the acidity.

W. C. BIXBY.

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### TWENTY YEARS' EXPERIENCE IN CANE CULTURE.

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HONOKAA, HAWAII, Sept. 18, 1882.

EDITORS PLANTERS' MONTHLY :—I will endeavor to give you a short account of my experience in growing sugar cane and manufacturing of sugar, of twenty years, or more, experience, and the different lands and places, high and low elevations.

In this as well as in all my voyaging I deem it necessary to take a clean departure in order to meet my destination correctly.

Now the present way of manufacturing and expensive machinery of the present date, is all well known by all our planters, and the story has been told, of the present process, and manipulation, and of the density of the juice and the number of ounces per gallon, and the polarization all explained. So the history of the present is a short story, and some of the planters and managers find it as necessary to *blow* and tell of 7 and 8 tons per acre, and 22 and 23 ounces of sugar per gallon, so as to keep steam up. But the fact is in many fields the acreage is guessed at, and the field perhaps would measure more acres and a less number of tons per acre. As I am a planter myself, I claim the right to criticize. I now say myself,

that 3½ and 4 tons in a field of 100 acres, including outs, is a very good crop, and this is more than the average per acre throughout our Islands.

Now I go back to where I commenced and make clean my departure.

In the year 1849, about the first of October I arrived in Lahaina officer of a whaleship. Gold mine excitement was raging high, I got my discharge having the gold-diggings on the brain, and intended to go to California. I took a room with an old acquaintance of mine Alfred W. Parsons, who was then Police Magistrate of Lahaina, and lived on the David Malo premises, and had a sugar mill erected there for the purpose of making syrup, which was disposed of to whaleships at a good price. The first day on shore, Judge Parsons showed me around his mill and the land he had just cut his cane off in front of the David Malo house, and about half an acre where the Lahaina Prison now stands. Judge Parson's sugar works was composed of one wooden mill and three try pots bought from whaleships, and two or three scrap-tubs, the pots were set on stones and adobe, no lime or cement being used in setting them. Judge Parsons had much to say about his good quality of syrup, and showed me the *Friend* of '48 or '49, I am not sure which year, where Mr. Damon gave high praise of the good quality of syrup made by Judge Parsons at Lahaina. At that time cane was only planted on kalo patch banks for the use of the people to eat. Judge Parsons said the trash did not quite supply him with fuel, but he had the privilege of cutting indigo off the kuleana just mauka of his works, where afterwards Marshal Odinet planted the first cane, known now, as the Lahaina cane throughout our group, as I have understood brought here by Capt Edwards of the whaleship Geo. Washington, from Marquesas Islands, South Pacific Ocean.

John L. Gower arrived from Makawao and took a room in Judge Parson's house, during his short stay in Lahaina. During the evening I heard much said about sugar making, and Mr. Gower spoke in high terms of his crop of cane. Said he would increase his works. Judge Parsons then and there sold his mill to Gower and engaged me to take it down and prepare it for shipment to Makawao, which I did, and in a short time had it all ready to ship. This was the first of my having anything to do with a sugar mill. J. L. Gower had purchased the MacLain plantation, which was considered one of the best estates of that day, now owned by Messrs. Brewer and Akana. In the year 1850 A. B. Howe bought the Hana plantation of Mr. Lingrin who had planted 60 acres of cane and put up a primitive sugar works in grass houses. The train was four try pots which had been bought from whaleships, and a wooden mill, worked by four yoke of cattle. In the year 1851 I bargained with Mr. Howe to take the plantation to run, and went in company with Dr. Judd to Hana to see and inspect the place. Mr. Howe took passage in a schooner, and we met him there. I was much pleased with the place, the plant cane was very promising and wild cane everywhere. A young man by the name of Chapin had charge at the time. I made a final agreement with Mr. Howe, and

the stock and place was turned over to me by Mr. Chapin. Dr. Judd had a chart of the Wananalua land, and the boundary was pointed out to me by a native named Hopu, an old resident of the place, and the Wananalua land became part of the Hana plantation, and one other large piece of land I afterwards leased of John Richardson, who was at that time Circuit Judge of Maui. This with several other small kuleanas composed the Hana plantation. My first work was grinding wild cane, which was growing all about the land everywhere; in some places very good cane, at that time there were but two kinds of cane, the old white cane which grew very high and straight, and a smaller kind of cane, the natives said it came from Tahiti, it grew wild, very straight, and the leaves dropped off as the cane matured. I planted of both kinds, which grew nicely by cultivation, and brought forth a good crop. The land was stony but very rich, a lava soil, the cane juice very good and easily converted into sugar. Sugar manufacturing was a new business to me. I had no sacharometer and had no way of testing the strength of the juice, the fact of its being good was found by the easy manner the sugar was made. The sugar crystalized and was of a very bright grain. I did not make second sugar, syrup was in demand by whaleships, and sold at a good price. I shipped my sugar to B. F. Bolles & Co., of Lahaina, and it was sold readily. Hana district seemed to be a natural place for cane to grow. My sugar boiler died, and at that time sugar boilers were scarce, so I was obliged to try my hand, and accordingly I went into the sugar house. With two men who had worked with the sugar boiler, and being very attentive to my duty all day, I made my strikes of sugar out and into the coolers, at the time to close up the work and shut up the house. I went to the coolers but no sugar grained at that time. I supposed it all syrup, so I told my natives that we would boil it over the next day; the next morning, before I had had time to go to the sugar house, one of my men came running into the store in high glee and said the sugar was *paalooa*. I went there and sure enough, the sugar was grained up hard to the top. I said then to myself what a *humbug* to pay \$300 to learn to boil sugar. Mr. Bryan who boiled sugar for Dr. Wood, was the man who gave lessons in sugar boiling, and \$300 was his price. Long since then I have known from \$300 to \$500 paid to learn to boil sugar. My experience has learned me that the way to make good sugar and easy to manufacture, is to commence the work in the field. Plant good seed and at the right time, according to the elevation of your land, cultivate well, strip, and keep the cane clean and clear of ratoonns then there will be no difficulty in making sugar of a good quality, it only requires a careful hand in the sugar house, and men that understand machinery and the manufacture.

Early in 1852 Mr. Howe sent me a train of cast iron sugar kettles and an iron mill, and a man by the name of Patent came up to erect the mill. He proved to be a failure and I discharged him, and took the work on my own shoulders, and with my blacksmith we constructed the works our-

selves. Mr. Jones the mason, who did the mason work at Waihee, and put up that chimney was my mason and set the train of kettles, and put up the chimney. This train of kettles was the second ever erected on the island of Maui. This train of five kettles was small but very complete. Before that time only ship's try-pots were used for making either sugar or syrup. About this time one of Mr. Weston's centrifugal machines was sent up, a four man power attached, by wheel and belt. This was one of the first Mr. Weston ever made. I had it set according to directions, with a post in the ground eight feet deep, filled in with stones and cement, the spindle of the machine was inserted in the end of the post, on which the machine run, and the molasses led off to the tank below. This machine was a curiosity to the people, and sometimes a hundred or more natives came to see it run, the school boys would come every afternoon and run the machine until night without pay, and would dispute their turn to run it, they would make it hum. Natives were plenty in that district at that time, the school children and other natives made a practice of coming to put my trash in the trash house in afternoons, which I was obliged to have done, on account of frequent showers of rain; when all was done, they would go to the store and be paid off, by each receiving one card of matches for their services. (I simply mention this to show the change of time.) I planted one field of cane down by the sea, that was fenced in years gone by, by a deep trench cut around in a semicircle, each end to the sea. I supposed it was an ancient fortress, in the days of Kamehameha's battles, but the old natives told me no, that it was a pig-pen. The cane suffered some by the sea-side, by the salt spray. I had no trouble to make sugar, and molasses was quite salty. This salt spoken of was not in the sap of the cane, dry salt could be found on the leaves and stalks, this then was the cause of salt taste in the juice and condition of the sugar.

I shipped the sugar to Mr. Coady, who forwarded the salt sugar to San Francisco. I heard no complaint from Mr. Coady in regard to the sale of it. The molasses was shipped to Mr. Bolles and sold to whale ships. I heard no complaint from them. I found the cane above, on the land of lava soil, the best for cane and very pure rich juice; as I have said before, I had no sacharometer, and had no way of testing the strength of the juice, except by the good quality of the sugar and the ease with which it could be converted into sugar.

Before my new works were completed the death of Mr. Howe took place, which put a stop for a while to my business, though the crops were cared for. (Marshal Parke, Public Administrator, appointed me to take charge of all property until Mr. Howe's estate could be settled.)

In due time the Hana estate was sold at auction, and the plantation was bought by Dr. Judd, and turned over to me as he bought it. I then went on and put up all the new works, and erected a new sugar house, and commenced cutting my crop, which was ready, and good clean cane, about 150 acres. My sugar I thought very good, quite different from what I had

made in the old way, of boiling in try-pots. As Dr. Judd had been my friend from the beginning, I put up a keg of my first make with my new train of kettles, sent it down to Honolulu as a present to Dr. Judd. The Agricultural Fair came off soon after its arrival, the Doctor put it in the Fair as a sample of sugar from the Hana plantation, which took the second prize, a silver cup, with day and year, and my monogram, and second best sugar in the fair, engraved on it. Dr. Judd wrote me that my sugar was considered by all the best by merit, but as I was not a member of the Agricultural Society, I could not take the first prize. The first prize went to Dr. Wood of Koloa. My cup went with other old relics much prized by me, in the wreck of the Eugenie Briggs.

I made between sixty and seventy tons of sugar, making a good quality of first and second sugar, but no third sugar, for the good reason that the molasses brought a good price and ready sale to whalesh ips. Before I had made any shipment of sugar, my sugar-house and boiling-house was fired and burned down, and over 50 tons of sugar destroyed, and molasses tank bursted by the people endeavoring to move it, and the contents lost.

I went to Honolulu to get credit to rebuild my works for the very good reason that I had a good crop of cane to take off, but I was refused and persuaded to give it up. Sugar making was not looked upon favorably by the merchants in Honolulu. L. L. Torbert had not succeeded well, John L. Gower found Lihue, Kauai, unprofitable, some of the shareholders having given up their stock. Boardman & Miner shut down and gave up planting above Haiku, and let their mill and sugar houses stand unoccupied. I turned over the Hana plantation to Dr. Judd, everything as it stood, and took my stock of goods and went to Kawaihae, fitted up the Stackpole store, failed, made a satisfactory bargain with B. Pitman, sold out my stock of goods to him, and took to the sea again; after about eight years of sea life I returned to sugar planting again in the year 1861. At Makawao I entered into contract with Mr. Torbert, Superintendent of the Haliimaile plantation, to plant 250 acres of cane. My contract read as follows: \$12 an acre and \$12 a ton of sugar, for clearing off and ploughing three times and harrowing three times, furrowing and planting, no advance, \$6 per acre when planted, and allowed to draw \$1 per acre monthly, for cultivating, Mr. Torbert finding cattle and ploughs. I planted 240 acres of cane, and cultivated it up to maturity. I planted white cane, although red cane had been the favorite for Makawao. The year 1862 was very dry and cane suffered very much. Mr. Torbert left for the new enterprise at Waihee, and entered into a new contract with me to run the Haliimaile plantation, excepting the manufacture of sugar. As I had the cane field in my charge, I studied the tops by drouth and frequently examined the cane that was hurt by the drouth, it would fall short considerable in quantity to the density of the juice by sacharometer. Samuel Spaulding was the sugar boiler, and I frequently tested the density of the juice of the different cane, and watched closely the result, which I found

to my satisfaction, that cane that was hurt by drouth would not granulate as the cane in a healthy state of preservation would.

Sugar cane which has been exposed to a severe drouth while in the field nearly ripe, causes a rupture of the juice cells, and allowing the pure sugar water which they contain, to mix with the crude sap. I have often taken large stalks of cane to all appearance good, the outside bright and clean, when cut open I would find open spaces in the heart of the cane, turned red, and this excites the first step in the fermenting process, and in a very short time, if the cane remains exposed to a warm sun complete conversion of a good part of the crystallizable sugar they contain takes place. The high ridges of land and the tops of rolling lands, are the first to be affected, and if the dry warm weather continues the whole field partakes of the infection. The first step in the change which thus occurs, is the conversion of crystalizable to uncrystallizable sugar, and this may take place before fermentation is indicated or even suspected.

This has been my experience at Makawao and the lower fields of Pahala, Kau. I examined and found the cane affected the same when the cane suffered from drouth. Now in cane fields not hurt by drouth, which has stood by the proper time for grinding, and the cane is on the decline, fallen down, and some stalks partly dead and covered with trash for some time, in close humid weather, or when warm rains prevail, conversion occurs in a short time. Again small portions of juice left over, in pipes or vessels, or minute fragments of saturated bagass, or trash remaining in the mills, soon becomes changed, and when mixed with fresh juice, excites the state or conditions which have acquired the vinous fermentations; the acetic, the lactic, the mucous, or vidcid and the putrid, each exciting in juice conversion of cane sugar to glucose followed by further change to the particular state of the excitants respectively.

In the operation of boiling cane juice, if large quantities of cane juice are operated upon at one time, involving a long exposure of the solution to boiling heat, the conversion becomes total, and this result is inevitable. Other effects of an injurious character are produced by protracted exposure of the juice, or rather of the dense and nearly concentrated solution to heat.

When I commenced planting at Halemaile plantation, I was in favor of planting white cane, and afterwards found to my satisfaction that I was right. Mr. Torbert planted red cane about the same time, in an adjoining field. The white cane withstood the drouth much better than red cane. White cane has a strong block of roots, and penetrates much deeper into the earth than any other cane. I have known the fine roots of white cane from six to eight feet deep in the earth, consequently it stands drouth much better than any other. When I speak of white cane, I mean the old Keoukia, or old white cane.

GEO. W. WILFONG.



*HAWAIIAN AGRICULTURAL SOCIETY.*

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The new Hawaiian Agricultural Society, lately formed in Honolulu, is modelled after the Royal Hawaiian Agricultural Society of 1852. Its objects are to promote and manage Agricultural expositions and cattle shows. At the first preliminary meeting the following motion was carried:—  
“Whereas it is desirable to attract all classes of exhibitors, and to secure the exhibition of stock and produce from all parts of the Kingdom, the association ought to be in a position to offer prizes of some value to be competed for, and also, if found necessary, to place exhibitors from the other Islands on the same footing as those resident on Oahu, by sharing the cost of transportation, be it resolved: That a petition be presented to the Legislature asking for an appropriation of \$5,000 to assist the association in the objects it has in view.”

The petition was presented to the Legislature, and \$5,000 was appropriated for the object.

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ITEMS.

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— Union Mill, Kohala, has finished planting, and is now grinding.

— Hawi Mill, Kohala, has just finished planting 485 acres, and will get up steam next week to finish the crop.

— C. C. Coleman has taken his planting machine to Spreckelsville on Maui, but has not yet given it a fair trial there.

— Applications have been made for Charters of incorporation for the Onomea Sugar Company, and the Paukaa Sugar Company.

— The month of October is usually a clear dry month, and so far this year it has not proved an exception to the rule.

— “Three things seem essential to success in business: 1. To *know* your business. 2. To attend to it. 3. To keep down expenses until your fortune is safe from public perils.”

— Another month has passed and present reports of the crops seem to justify the expectations expressed in our last number. The crop promises to be the largest yet harvested.

— The supply of coal in the country is larger than usual, and prices are favorable. The supply of lumber is hardly adequate to the demand, and prices have advanced.

— Mr. Paul Isenberg, so largely interested in sugar in these Islands, and a member of the firm of Messrs. Hackfeld & Co of Honolulu, sailed for San Francisco on the last steamer en route for Germany.

— The Pioneer Mill Company at Lahaina has just received its railroad

plant. It consists of steel track of a thirty inch gauge, cars and a locomotive. Mr. Johnson is now laying the track.

— The schooner *Julia* may be expected next month on her return from the New Hebrides. It is hoped that her cruise will prove successful—even 100 additional laborers will be hailed with pleasure.

— The demand for laborers is still great. The Portuguese immigrants per S. S. *Hansa* were very acceptable, but their number was small as compared to the demand. The misfortune of the interruption of the Portuguese Immigration is keenly felt.

— At last advices the sugars sent to New York had not been sold. The question as to whether or not they were dutiable had been raised, and had been referred to Washington. The results of this experiment will be looked for with great interest by all.

— Among the planters who have returned during the past month from brief trips abroad we notice the names of Mr. R. Renton, Mr. W. H. Ricard, Mr. S. T. Alexander and Mr. J. Marsden. Other names may have escaped our attention.

— Since our last issue the following orders for machinery have been received by the Honolulu Iron Works: 1 triple effect for Waianae Co., 1 double effect for Koloa Sugar Co., 1 double effect for Lihue Plantation, 1 double effect for Hanamaulu Plantation, 1 vacuum pan for Wong Leong.

— The Waimanalo Sugar Company has ordered another locomotive, as has also the Waianae Company. The Koloa Sugar Company has ordered a railroad plant for next year. It will consist of four miles of 30 inch track, forty cars 5x10 feet, and one locomotive.

— Makawao District, Maui, takes the lead in the matter of reservoirs for storing water, the following is a list of the reservoirs now in use on plantations in that District: Haiku Plantation 2, Hamakuapoko 6, Alexander and Baldwin 4, J. M. Alexander 1, Grove Ranch 3, Spreckels Plantation 2.

— In the Makawao District the area of land planted with cane this summer is as follows: Haiku 250 acres, still planting; Hamakuapoko 240 acres, finished planting; Alexander & Baldwin 230 acres, finished planting; Grove Ranch Plantation 225 acres, still planting; Spreckels Plantation 2,000 acres, still planting.

— Copies of the MONTHLY have been sent abroad to sugar growing countries, and we hope soon to receive exchanges from the editors of periodicals published in the sugar planting interests. *The Sugar Planter* of Maryborough, Queensland, has quoted from the MONTHLY, and has called attention to the organization of the Hawaiian Planters' Company.

— Information comes from the various Islands of preparations being almost everywhere made for taking off the coming crop. There has been a marked improvement of late years in the quality and completeness of machinery used, but perhaps in no direction has greater progress been made in our mills than in the appliances and tools procured. Many mills now have outfits of mechanics and engineers tools, and of lathes of the most improved type.

— Mr. Hayselden of Kohala, sends us the following: Cost of planting forty acres Cane: (Cane hauled 1½ mile.)

Stripping and Cutting.....	\$ 43.23
Hauling, (with oxen.....)	124.50
Furrowing.....	96.50
Cutting the Seed up and Planting.....	134.95
	\$399.18

Or say about \$9.98 per acre.

— Of all classes of employees engaged in carrying on plantation work perhaps there are none which attract less public attention than the engineers. But they are a very important class. The successful running of a mill often is due largely to the engineer. That a large number of incompetent men have come to the country professing to be engineers there is no question. But there are many now having the care of plantation machinery who are first class engineers, and whose services are highly valued. In this branch, as in others, the man who shows himself a thorough workman and serves his employers interests faithfully is sure to find his services in demand.

— Mr. W. E. Rowell has been appointed Superintendent of the Kahului Railroad. This road has done good service for Maui planters who ship sugar from the port of Kahului. Captain T. H. Hobron has this summer built a substantial wharf at Kahului, which not only facilitates the work of the road but is a public improvement. During the past nine months over 10,000 tons of sugar were shipped from Kahului for foreign ports besides a large quantity shipped to Honolulu. The cargoes from foreign ports and from Honolulu which have been discharged at Kahului during the same period have also been very large, but we have not the figures of the amount at hand.

— Attention is called to an interesting extract from *Tropical Agriculture*, a very full and exhaustive work on the subject, published in London and New York in 1877, for which we are indebted to Mr. Loebenstein, sugar boiler at the Papaikou Plantation. The subject of Central Sugar Factories or "Usines" is one of growing interest to us, and all facts from the experience of others are valuable. The country would be much benefitted could more of this system be introduced and a larger number of small

landholders induced to plant cane. It may be that the system pursued in Martinique of paying for such a per cent. of sugar, rather than a division may be found most practicable.

## ESTIMATE OF SUGAR CROP OF HAWAIIAN ISLANDS FOR 1883.

Name of Plantation.	Agents.	Tons	Name of Plantation.	Agents.	Tons
Pepeekeo Plantation	C. Afong.....	1800	Grove Ranch "	H. Hackfeld & Co.	900
Wailuku "	C. Brewer & Co.....	2200	Waimanalo S. Co. "	" " .....	1800
East Maui "	" " .....	700	R. M. Meyers.....	" " .....	50
Onomea "	" " .....	700	Ahuimanu Plant'n.	Hoffschlaeger & Co.	150
Paukaa "	" " .....	800	Makee "	W G Irwin.....	250
Honomu "	" " .....	750	Waihee Sugar Co.	" " .....	1000
Princeville "	" " .....	1000	Hawaiian Com'l Co.	" " .....	4000
Hawaiian, A. Co....	" " .....	2500	Makee Sugar Co....	" " .....	1600
Kaneohe Plantation	" " .....	250	Kealia Plantation .	" " .....	800
Hitchcock & Co. "	Castle & Cooke.....	1000	Honoa po "	" " .....	
Kohala "	" " .....	1200	Naalehu "	" " .....	3500
Waialua "	" " .....	700	Hilea Sugar Co.....	" " .....	1800
Haiku No. 1 } "	" " .....		Star Mill Sugar Co.	" " .....	1000
Haiku No. 2 } "	" " .....	2400	Hakalau Plantation	" " .....	2000
Alex' der & Baldwin	" " .....	1700	Wainaku "	" " .....	300
Union Mill Co.....	T. H. Davies.....	1000	Paauhau "	" " .....	1500
Niulii Plantation...	" " .....	1600	T. Spencer "	G W Macfarlane..	1000
Hawi Mill.....	" " .....	1500	Heeia "	" " .....	650
Hamakua Mill.....	" " .....	1500	Waikapu "	" " .....	800
Waiakena ".....	" " .....	1100	Huelo Mill Co.....	" " .....	700
Lidgate & Co.....	" " .....	1800	Waianae Sugar Co.	H A Widemann...	800
Kipabulu Mill.....	" " .....	500	Olowalu Sugar Co..	" " .....	600
Ookala Plantation..	H. Hackfeld & Co..	1200	Kamaloo Plantation	J. McColgan.....	150
Hanamaula "	" " .....	1400	Halawa "	J. S. Walker.....	1000
Koloa "	" " .....	2000	Honokaa Sugar Co.	F. A. Schaefer & co	1500
Kilauea "	" " .....	1200	Pacific Sugar Mill..	" " .....	1100
Lihue "	" " .....	2000	Eleele Platation....	" " .....	1000
Kekaha "	" " .....	1000	Laie "	J. T. Waterhouse.	150
Pioneer "	" " .....	1500	Moanui "	Wong Leong & Co	300
Hana "	" " .....	1000			
Total.....					68400

The name of the mills only are given, except Grove Ranch. There is yet to come to from crop of 1882 from those plantations which count their crop from January 1st in December 31st, some 4500 tons. A great many of the plantations will begin their crop of 1883 in November and December this year, 1882.

From the Secretary of the Board of Immigration, we have obtained the following statement of the Portuguese immigrants who arrived in September by the steamship *Hansa*.

The ship sailed from the Azores July 14th, and arrived at Honolulu September 9th.

— The results from 1146 acres of plant cane at Spreckelsville for the last crop are as follows :

Tons of cane ground.....	44,909.8
Gallons juice extracted.....	5,803,728
Sugar produced,	Pounds. Per cent.
No. 1.....	7,592,756..... 78.8
No. 2.....	1,801,558..... 18.7
No. 3.....	240,889..... 2.5
Total.....	9,635,203..... 100.0
Tons of cane per ton of sugar.....	9. 4
Lbs. of sugar per gallons of juice.....	1.63
Tons of sugar per acre.....	4.20

The weight of sugar above does not include about 70 tons of bags in which it was packed.

The immigrants found employment as follows:

	Men.	Women.	Minors.	Children
Eleele Plantation.....	8	7		
Honokaa Sugar Co.....	15	13	1	22
Pacific Sugar Mill.....	2	3		4
Kilauea Sugar Co.....	24	24	2	45
A. S. Wilcox.....	5	4		9
Koloa Sugar Co.....	12	9		16
Hana Plantation.....	19	16		25
Ookala Sugar Co.....	10	9		13
Paukaa Plantation.....	9	11	1	15
Onomea Plantation.....	21	21		28
W. Lidgate & Co.....	29	27		48
Chas. Notley.....		1		3
Waihee Sugar Co.....		1		3
Waianae Co.....	21	24	1	37
Grant & Brigstock.....	10	11		23
Makee Sugar Co.....	15	16		26
Hakalau Plantation.....	10	10	6	15
Costa & Co.....	6	6		5
Hilea Plantation.....	3	2	1	
Kohala Sugar Co.....	10	11		10
Alexander & Baldwin.....	11	14		16
Hitchcock & Co.....	7	7		20
Kekaha Plantation.....	8	7		9
J. Halstead.....	4	7	1	5
Honomu Plantation.....	22	25		35
J. T. Waterhouse.....	2	2		3
His Majesty.....	4			
Waiakea Plantation.....	22	22	2	44
Domestic Service, Honolulu.....	1	20		4
	310	329	15	463

On the voyage 25 deaths occurred, of these 2 were women and 23 were children, and thirteen births. At the Immigration Depot, Honolulu, there were 2 births and 3 deaths.

NOTES ON USINES AND THE MANUFACTURE OF SUGAR AS CARRIED ON AT MARTINIQUE.

1. *Contract between Planter and Mill-owner.*—The engagements between the Usines and the cane-growers are generally for periods of ten years.

2. *Proportion of Sugar allowed in Exchange or Payment for Cane.*—When first established, the Usines only allowed the planters 5 per cent. of sugar per 100 lbs. of canes, but some of those lately established give as high as 6 per cent.

3. *Mode of Paying the Cane-growers.*—Sugar is never actually given by the Usine to the cane-grower, but the value of so much per cent. per 100 lbs. of canes: this value is fixed in the following manner:—Every fortnight the average between the highest and lowest prices quoted at St. Pierre for muscovado is taken, and such average price fixes the value of the percentage allowed by the Usine to the cane-grower; thus:

—A. sends 500,000 lbs. of canes to the Usine from the 1st to the 15th March; the Usine allows 5½ per cent.=27,500 lbs. of sugar for the 500,000 lbs. of canes. The average price of muscovado sugar at St. Pierre is, during the same period, say, \$3 per 100 lbs.; 27,500 lbs. sugar at \$3 per 100 lbs.=825. To this amount, therefore, A. will be entitled for his 500,000 lbs. of canes. The cane-grower is thus excluded from participation in the advantages of the manufacture of the superior quality of sugar made by the Usine, except to a moderate extent at those Usines, where, after a certain percentage of the profits has been reserved for the shareholders and for a reserved fund, the balance is divided between the cultivators of the canes and the proprietors of the Usine.

4. *The Carts go by Usine Tramway from Estate to Usine: but carted from Cane-piece to Tramway.*—The Usine is fed by means of tramways which are laid down with regard to the configuration of the ground, rather than directly, to save cartage to the cane-growers, who generally, if possible, suit their cultivation to the direction of the tramways. On *Les Diques* estate the canes for a crop of 300 barriques (=about 150 42-inch hlds.) used to be carted by about forty-five oxen, to a small mill of about 5 horse-power, driven by water: now, by sixty oxen, they cart canes to the tramway sufficient to make 500 to 600 barriques; that is to say, with one-third more oxen, they are able to cart canes sufficient to make about double as much as formerly. The railway passes near the centre of the estate; the cane-pieces farthest from it are barely a mile off. On some estates, however, I am informed, the cartage is from 2 to 3 miles.

5. *Varying Price, and Participation in Profits.*—Where the Usine gives the value of 6 per cent. per 100 lbs. of canes (to the cultivators) there is no participation, on the part

of the cultivators, in the profits of the Usine; but at the neighboring Usine of *Petit Bourg*, where the canes of *Les Diques* estate are manufactured into sugar, the cane-growers, I was informed, received the value of 5½ per cent. (of manufactured sugar per 100 lbs. of canes), and after 11 per cent. interest had been handed over to the shareholders, the remainder of the profits were divided between the shareholders and the cane-growers. The arrangements between the Usine and the cane-growers are, as far as I have been able to learn, those that have been lately established give more liberal terms to the cane-growers than those of some years' standing.

6. *Some Canes sea-borne to Usine.*

—Some of the Usines on the seaboard bring the canes by water, when steamers are employed to tow iron barges in which the canes are transported, sometimes from 6 to 8 miles.

7. *The Petit-Bourg Usine.*—The canes are ground in a mill of 45 horse-power, made by Cail & Co., of Paris. The rollers are much thicker in proportion to their length, than the general run of mills manufactured in England and Scotland; Although of 40 horse-power, the mill at the *Petit-Bourg* Usine has rollers only 5 feet in length. This mill extracts about 72 per cent. from plant canes, and from 60 to 70 from rattoons. The steam is supplied, both for the machinery and boiling, by five multitubular boilers of the shape of locomotive boilers. Were coal only used, these boilers would be equal to 100 horse-power each, but as the megass is consumed in the boiler furnaces immediately on its issuing from the mill by the aid of 2 tons of coal per diem for each boiler, their efficiency as generators of steam is diminished about one-half; that is to say, the five boilers barely supply 300 horse-power. The amount of sugar manufactured is about 15 tons per day of fifteen

hours; and the waste of animal charcoal about 15 tons per annum. Sixteen centrifugals are used, driven by two 12-horse engines. This Usine, which is not on a large scale, is fed by means of about 6 miles of railway: the rails weigh about 25 lbs. to the yard; the gauge is about 4 feet. Sixty cane-wagons are employed, measuring  $11 \times 8 \times 2\frac{1}{2}$  feet, each capable of carrying about 6,500 lbs. of canes, and each drawn by one mule, of which there are twenty-five attached to the Usine, all small animals. The average cost of the tramway, per mile, in an undulating country, is about \$7,000 per mile; on level land, the expense hardly exceeds \$5,000 per mile. There are three lines of rail laid down before the mill, to facilitate the discharge of the wagons. The cane-wagons on the tramroad are loaded by the cane-growers, but they have nothing to do with the expense of traction on the tramway, or the cost of laying it down or repairing it. From the mill, the megass is carried by a web to a platform about 16 feet above the ground; this platform is about 40 feet square, close-boarded to a height of about 6 feet, except where the web discharges the megass at the end of the platform opposite the discharging web, on five shoots leading direct to the furnace mouths of the boilers, at an angle of about  $50^\circ$ . The megass is put into the furnace by the stoker, with sufficient coal to enable it to burn freely. The boilers contain from 120 to 130 tubes, 3 inches in diameter inside, and about 18 feet long. The grating surface is about  $4\frac{1}{2}$  by 6 feet. The chimney is 70 feet high by 3 feet in diameter, and of sheet iron. Each boiler has a separate chimney. The sides of the boilers are not coated with any non-conductor, as it has been found that the damage caused to the boiler by the contact of any insulator and any leakage that may take place, is not compensated for by the heat saved

which would otherwise be lost by radiation.

8. *The Usine always more advantageous to the Cane-grower than an Estate Mill.*—Some planters are of opinion that if they had mills of from 25 to 30 horse-power, it would pay them better to manufacture their own sugar, than to send their canes to the Usine. I am inclined to think, however, that if the data they have given me are correct, the Usine, under any circumstances, pays them better. I conceive that the profits of the Usines are generally much greater in proportion than the profits of the cane-growers who supply them. The Usine should be established by planters, they being the shareholders. So great are the profits of the Usine, that almost every year a new one is started in Martinique, and not the slightest difficulty is experienced in raising the necessary funds.

9. *Cost of establishing an Usine.*—The plant of an Usine capable of making, say 2,000 tons of sugar, costs, including about 8 miles of railway and \$4,000 for ten acres of land, about \$240,000. The largest Usine at Martinique was established by Baron de La Renty; it is called the *Usine de La Renty*, and is capable of making 3,750 tons. The plant cost \$500,000.

10. *Salary of the Manager.*—The *gerant*, or administrator (manager?), of the Usine gets, in addition to a salary of from \$3,000 to \$4,000, a percentage which often brings him more than his fixed salary. One of the most successful, and probably the most economical administrators in Martinique is M. E. Bougenot, of the *Usine Francois*. Such a man might probably be induced for \$5000, or \$6,000 to order the machinery for, and superintend during the wet season (when the Usines at Martinique are not at work) the erection of an Usine in Trinidad. I considered that even \$10,000 would be well laid out in securing the services of

one who has practically worked and established Usines at Martinique.

11. *Profits of Usines in Martinique.*—One of the Usines pays the shareholders from 40 to 48 per cent. per annum on the capital invested. I was informed that the average profit of Usines is from 25 to 30 per cent. per annum.

12. *Number of Hands employed.*—An Usine of 2,000 tons employs on an average 150 hands.

13. *Distillation of Rum.*—Besides the apparatus for manufacturing the sugar, there is attached to every Usine a distillery where the refuse is utilised for the manufacture of rum. I was unable to ascertain what were the profits of the distillery as compared with those of the manufacture of sugar, but was assured they formed a material item in the general return to the shareholders.

Perhaps some of our Mill Managers may find it worth while to try some methods of drying trash similar to the following, which has been found successful with wet hay.

A showery haymaking season, like a wet harvest, makes the question of harvesting crops in bad weather one of the highest agricultural importance. Attention has lately been extensively called to a mode of harvesting in the stack which Mr. R. Neilson, of Halewood, near Liverpool, has perfected and successfully practiced for many years. He has put the result of his experiments at the free use of his brother farmers, and it has been already extensively adopted with uniform success. Almost any kind of field produce may now be harvested in any weather without loss. The method is cheap and simple. As applied to hay the process is as follows:—When it is mown it may lie in swath a couple of days with a single turn over on the ground soon after cutting. It may then be stacked in a round stack, say twenty feet in diameter. The stack is built over a tube of wood or iron, which runs from its centre outwards. In the centre of the stack as it is built a sack of straw

or a basket is placed, which is drawn upwards as the stacking proceeds. Half way up the stack a small tube is inserted, just large enough to allow of a thermometer, fixed to the end of a lath, to be introduced to take the temperature of the stack. When the stack is finished there is a hollow space in the middle running up to about a third of its height, from the bottom of which a large tube runs into the open air. The end of this tube is connected with an exhaust fan, and as soon as the stack begins to heat, the fan is set to work, and the damp is drawn forth in a cloud of steam. The fan exhausts the tube, the outer air presses through the stack in all directions to supply it, and the hay is cooled and dried. The stack can thus be kept at any temperature by watching the thermometer; and a little careful attention has been found to make the condition of the hay thus treated perfect, even in cases in which it had been stacked quite wet. The method is easy to carry out; it saves in labor in the hayfield what it costs in simple machinery; and unless the statements made about it are greatly exaggerated, it makes the farmer largely independent of the weather.