

THE HAWAIIAN PLANTERS' MONTHLY

PUBLISHED FOR THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

Vol. XVII.] HONOLULU, DECEMBER, 1899. [No. 12

PROCEEDINGS

OF THE

Hawaiian Sugar Planters' Association

AT THEIR

Annual Meeting Held in Honolulu, Nov. 20 and 21, 1899.

The annual meeting of the Hawaiian Sugar Planters' Association opened, agreeably to notice, on Monday morning, November 20, in their hall in this city, with Hon. H. P. Baldwin in the chair. There was the usual attendance of between thirty and forty, all the plantations being represented.

The minutes of the last meeting were then read by Secretary Bolte and approved. Also the treasurer's statement of the finances of the association, and the financial statement of Dr. Maxwell, in carrying on the Experiment Station. Both these reports were approved.

Dr. Maxwell stated that the increased expenses incurred in his department were on account of the largely increased work done in it. Considerable cane raised at the station had been

sold for seed. The work of the experiment station had very much increased on account of the new plantations which had been started, which made fresh demands on it. An invitation was extended by him to the members of the association to visit the experiment station on Makiki street on Tuesday morning at 9:30 A. M. to inspect the work which is there being carried on.

Secretary Bolte then distributed the following list of plantations, agencies and the crop of each estate, given in short tons of 2000 pounds, the whole crop amounting to 282,807 short tons, or 251,384 long tons.

STATEMENT OF HAWAIIAN SUGAR CROP, 1898-1899—
FROM OCTOBER 1ST, 1898, TO OCTOBER 30TH, 1899.

HAWAII.

	Tons.	Total Tons.
Waiakea Mill Co.....	9,191	
Hilo Portuguese Sugar Mill Co.....	932	
Hilo Sugar Co.....	6,880	
Onomea Sugar Co.....	8,404	
Pepeekeo Sugar Co.....	7,350	
Honomu Sugar Co.....	4,968	
Hakalau Plantation Co.....	8,980	
Laupahoehoe Sugar Co.....	5,337	
Ookala Sugar Co.....	3,564	
Kukaiiau Plantation Co.....	1,748	
Kukaiiau Mill Co.....	1,732	
Hamakua Mill Co.....	6,081	
Paauhau Plantation Co.....	7,529	
Honōkaa Sugar Co.....	9,111	
Pacific Sugar Mill.....	4,650	
Niulii Mill and Plantation.....	2,226	
Halawa Plantation.....	1,049	
Kohala Sugar Co.....	4,119	
Union Mill Co.....	1,668	
Hawi Mill (R. R. Hind).....	1,222	
Beecroft Plantation.....	609	
Hutchinson Sugar Plantation Co.....	7,732	
Hawaiian Agricultural Co.....	11,318	
L. Chong (at Pahala).....	839	
		117,239

MAUI.

	Tons.	Total Tons.
Kipahulu Sugar Co.....	1,931	
Hamoia Plantation	2,026	
Hana Plantation Co.....	3,175	
Haiku Sugar Co.....	4,865	
Paia Plantation	6,268	
Hawaiian Commercial & Sugar Co.....	16,621	
Wailuku Sugar Co.....	7,412	
Olowalu Co.....	1,502	
Pioneer Mill Co., Ltd.....	10,589	
	<hr/>	54,389

OAHU.

Waimanalo Sugar Co.....	2,352	
Heeia Agricultural Co., Ltd.....	2,191	
Laie Plantation	494	
Kahuku Plantation Co.....	7,008	
Waianae Co.	3,506	
Ewa Plantation Co.....	22,334	
Oahu Sugar Co.....	7,935	
	<hr/>	45,820

KAUAI.

Kilauea Sugar Co.....	5,420	
Makee Sugar Co.....	9,350	
Lihue Plantation Co.....	13,333	
A. S. Wilcox.....	3,962	
Grove Farm Plantation.....	1,751	
Koloa Sugar Co.....	5,268	
McBryde Sugar Co.....	1,491	
Hawaiian Sugar Co.....	14,350	
Gay & Robinson.....	1,821	
Waimea Sugar Mill Co.....	1,021	
Kekaha Sugar Co.....	6,942	
Estate V. Knudsen.....	650	
	<hr/>	65,359
Total (in short tons).....		<hr/> 282,807

AGENTS.

W. G. IRWIN & CO., LTD.		Total Tons.
	Tons.	
Paaubau Plantation Co.....	7,529	
Hutchinson Sugar Plantation Co.....	7,732	
Hakalau Plantation Co.....	8,980	
Hilo Sugar Co.....	6,680	
Kilauea Sugar Co.....	5,420	
Waimanalo Sugar Co.....	2,352	
Olowalu Co.....	1,502	
	<hr/>	40,395

H. HACKFELD & CO.

Lihue Plantation Co.....	13,333	
A. S. Wilcox.....	3,962	
Grove Farm Plantation.....	1,751	
Koloa Sugar Co.....	5,268	
Kekaha Sugar Co.....	6,942	
Pioneer Mill Co., Ltd.....	10,589	
Kipahulu Sugar Co.....	1,931	
Kukaiiau Plantation Co.....	1,748	
Hilo Portuguese Sugar Mill Co.....	932	
Oahu Sugar Co.....	7,935	
	<hr/>	54,391

THEO. H. DAVIES & CO.

Waiakea Sugar Co.....	9,191	
Pepeekeo Sugar Co.....	7,350	
Laūpahoe Sugar Co.....	5,337	
Kukaiiau Mill Co.....	1,732	
Hamakua Mill Co.....	6,081	
Niulii Mill.....	2,226	
Union Mill Co.....	1,668	
Hawi Mill (R. R. Hind).....	1,222	
Beecroft Plantation.....	609	
McBryde Sugar Co.....	1,491	
	<hr/>	36,907

C. BREWER & CO., LTD.

Hawaiian Agricultural Co.....	11,318
Wailuku Sugar Co.....	7,412
Honomu Sugar Co.....	4,968

	Tons.	Total Tons.
Hamoia Plantation	2,026	
Makee Sugar Co.	9,350	
L. Chong (at Pahala).....	839	
Onomea Sugar Co.	8,404	
Ookala Sugar Plantation Co.	3,564	
	<hr/>	47,881
CASTLE & COOKE, LTD.		
Ewa Plantation Co.	22,334	
Kohala Sugar Co.	4,119	
Waimea Sugar Mill Co.	1,021	
	<hr/>	27,474
ALEXANDER & BALDWIN.		
Hawaiian Sugar Co.	14,350	
Paia Plantation	6,268	
Haiku Sugar Co.	4,865	
Hawaiian Commercial & Sugar Co.	16,621	
	<hr/>	42,104
F. A. SCHAEFER & CO.		
Honokaa Sugar Co.	9,111	
Pacific Sugar Mill.	4,650	
	<hr/>	13,761
M. S. GRINBAUM & CO., LTD.		
Hana Plantation Co.	3,175	
Heeia Agricultural Co., Ltd.	2,191	
Kahuku Plantation Co.	7,008	
	<hr/>	12,374
HENRY WATERHOUSE & CO.		
Laie Plantation	494	
Gay & Robinson.	1,821	
Halawa Plantation	1,049	
	<hr/>	3,364
J. M. DOWSETT.		
Waianae Co.		3,506
H. M. VON HOLT.		
Estate V. Knudsen.		650
		<hr/>
Total (in short tons).....		282,807

HAWAIIAN SUGAR PLANTERS' ASSOCIATION,

By its Secretary,

Honolulu, November, 1899.

C. BOLTE.

Reports of committee being next in order, Mr. Hugh Morrison of Makaweli, Kauai, read an exceedingly interesting report on the cultivation of sugar cane. This report possesses special interest from the fact that its author has recently visited the principal plantations on each of the larger islands of our group, and made a special study of the topics brought out in his report, which will be found inserted farther on in this issue.

At its close, comments were made by several of the members present. Mr. C. M. Cooke referred to some of the efforts that had been made during the past year to rid cane fields of these pests, and said that on the Lihue Plantation on Kauai \$8000 worth of these pests had been caught and destroyed by being put in boiling water.

Mr. Baldwin had found that stripping the cane, near the ground had proved to be one of the best plans tried.

Mr. Fairchild of Kauai coincided with the previous speaker, and added that on hillside where the lower part of the stalks were more exposed to the sun and air, the cane was less liable to attacks from these pests.

Mr. Horner spoke of some hill-side land on his plantation at Kukaiau, Hawaii, which had turned out very poorly, although it had been well supplied with fertilizer. He asked what could be the cause of failure of the crop in this case.

Dr. Maxwell replied, that the plowing of the high ground just before the great rains of the winter was probably the cause, as the rain getting into the soil leached the lime from the ground, leaving it in a measure without available food for the roots of the cane to feed on. In three districts of Hawaii experimental stations had been established, where experiments in fertilizer and irrigation could be made under the conditions existing in the districts. The results of these tests will be observed by trained men and the usefulness of the experimental station here will be greatly enhanced by the organization of sub-stations on the other islands.

The reading of the reports in full, although they were exceedingly interesting, occupied so much of the time of the convention, which was limited, Mr. Irwin suggested that in future the reports, to be presented before the convention, should be printed in advance, and each member be supplied with a copy. The suggestion was well received, and approved. In future, therefore, the reports to be presented to the convention should be sent to the secretary who will have them printed.

Another report on Cane Cultivation written by Mr. George R. Ewart, manager of Kilauea Plantation on Kauai, was also read by Mr. Morrison, chairman of the committee. At the close, an interesting discussion on the subject to which it was devoted was opened and continued till the noon hour of adjournment.

President Baldwin stated that heretofore the trustees had been selected, one member from each sugar firm in Honolulu; he thought it would be well to select any of the sugar men residing on Oahu.

During the noon interim and previous to the afternoon session, the trustees of the association met for the election of officers for the new year, with President Baldwin in the chair. The following officers were announced as having been chosen: Charles M. Cooke, president; F. A. Schaefer, vice-president; F. M. Swanzy, treasurer; C. Bolte, secretary; Geo. H. Robertson, auditor.

AFTERNOON SESSION, NOVEMBER 20.

At 2 o'clock p. m. President Baldwin called the meeting to order, and announced the result of the election, introducing Mr. Cooke as his successor as presiding officer. Mr. Cooke said he accepted the honor with some diffidence. When the association was first organized, the sugar output was only 18,000 tons. It had now expanded to 280,000 tons and the Planters' Association and work had widened with it. He did not feel competent to fill the office, but would do his best. He thought Mr. Irwin's motion at the morning session a good one, and believed the reports should be printed. He thought there should also be added a committee on attendance. He wanted to see the assembly room crowded next year with interested and enthusiastic planters.

It was moved and seconded to authorize the usual assessment for yearly expenses.

The report of the Committee on Fertilization, by Mr. A. Lidgate was then read and ordered published. It gave rise to considerable sharp discussion.

Mr. Baldwin alluded to the different opinions held by cultivators and scientists on matters now under discussion.

Dr. Maxwell pointed out similar variations in the results of analysis, but he insisted that the planters of Hawaii should know local conditions first; analysis was for the purpose of

comparison as well. He gave the life history and results of a given fertilizer and pointed out those elements, withdrawn by cane growth, which must be replaced. He insisted on facts, not on opinions. He agreed with other planters and believed that by following facts the soils could be scientifically kept up to the desired standard.

The discussion was also engaged in by Judge Hart and Messrs. Fairchild, Olding and Renton and others.

The report of the Committee on Sugar Manufacture was presented by Chairman Renton, which was accepted and ordered printed. Discussion followed by members.

The Committee on machinery reported "no report." It was moved and carried that the extraction of sugar method be made uniform and that the same committee be continued thereon and make a supplemental report. Dr. Maxwell was added to the committee as an ex-officio member.

Dr. Maxwell read a short but very interesting report for the committee on the Diseases of Cane, by Prof. A. Koebele, now in Australia. Accepted and ordered to be printed. After considerable discussion the meeting adjourned to meet at 9 o'clock Tuesday morning and proceed to the experimental station and to meet in regular session again at 10:30 o'clock.

TUESDAY, NOVEMBER 21.

VISIT TO THE EXPERIMENT STATION.

At 9 o'clock, some thirty sugar planters left the association aall, in carriages, to visit the Experimental Station, which is located at the junction of Wilder Avenue and Makiki street, near Punahou. The land covers several acres of the finest soil on the island, and is well adapted for the purpose to which it is devoted. The whole plat is under cultivation, and the arrangements for properly irrigating and fertilizing the various crops are apparently perfect. The visitors were personally conducted by Dr. Maxwell, who explained in detail the various methods by which he has been testing irrigation, fertilization and dry cultivation, notably with Lahaina and Rose Bamboo cane. Experiments have been exhaustive in the treatment of both kinds, especial pains being observed in distance and width between rows. Dr. Maxwell pointed out that he had made a special study of the development of cane on practical lines, observing carefully the amount of irrigation in each division.

In his fertilization experiments separate plots are treated with nitrogen, phosphoric acid and potash. It was observed

that those experiments which were treated with a minimum of nitrogen were far inferior to those containing nitrogen in combination. Tests which were made with nitrogen alone, proved unsuccessful. These experiments were conducted with Lahaina and Rose Bamboo canes. Dr. Maxwell is highly pleased with the results of his labor in this direction, and considerable interest was manifested in this particular branch of the work by the members.

The irrigation experiments were interesting in that the plots of cane which have been irrigated with weekly regularity and even amounts of water, were more successful than those on which heavier amounts have been used at longer periods of time. The cane experimented upon by irrigation equivalent to one rainfall inch of water was flourishing and very tall, the stick being of good diameter; the other cane was of less height although each plot was planted at the same time.

The members who visited the station and listened to Dr. Maxwell's interesting explanations of his vast number of detail experiments, were satisfied that the result will be beneficial to every plantation on the islands. Dr. Maxwell expressed the hope that the planters would not make individual imports of foreign cane, as the introduction of one kind of cane might be the means of introducing disease amongst the rest of the island cane which would necessitate heroic measures to eradicate.

In connection with the above, it may be stated that a proposition has been informally made by the United States Agricultural Department at Washington to the Hawaiian Planters' Association to take over the Experimental Station already established here and combine it with a United States station, which it is proposed to establish here. The suggestion has been favorably received by the trustees of the association, and correspondence opened to ascertain what the proposal of the Federal Government is. Until a formal proposition has been received, the Planters' Association will not be able to take final action. The ample resources possessed by the Federal Government, if they can be brought to assist our leading industries, will be of great advantage to us.

SECOND DAY'S SESSION, TUESDAY, NOVEMBER 21.

On returning from the visit to the Experiment Station, the regular session was opened about half past ten o'clock, with President Cooke in the chair.

Reports being the order of the day, that on labor, by Chairman E. D. Tenney, was called, which was read and accepted. It is printed with other reports later on.

At the close of the reading of this report, Dr. Maxwell stated that his report was prepared at the request of Senator Cullom, and in its preparation he had acted as the special agent for Hawaii of the Department of Agriculture of the United States. He added that the report was to be used hereafter in Washington and would probably be read before Senators and members of Congress.

On motion of Mr. Baldwin the labor report and Dr. Maxwell's statement were accepted and ordered published.

In calling for discussion President Cooke asked that the members consider the suggestion of the report asking that a committee of three be appointed to report further on labor.

In speaking of labor, Mr. J. M. Horner said that as the United States was expanding he thought perhaps plantation laborers might be secured from Manila; he did not think the United States would object. There were ten millions of people in Manila to draw from. In considering the labor question there were two points to be looked after. First, to get laborers from the outside, and, second, to get more help out of the laborers we already have. He also spoke of the plan of managing labor in the United States, where they had no lunas. There leaders were appointed to set the pace. Here the Chinese and Japs combine to take a certain speed which is always made equal to the slowest man in a gang, and none are allowed to work faster. The leader system would do away with this abuse and increase the help. The leader could not use such large bodies of men and it would take more leaders; but in cutting and stripping the leaders could be successfully used. He told of a day's experience where he had taken the place of a luna, where the work was done in one-half the usual time and at a moderate rate. He also told his experience years ago in planting two hundred acres of cane on Maui.

Mr. Baldwin said that in regard to profit-sharing he did not think it would work. The laborers here were not at present sufficiently intelligent. In his opinion the average laborer now used would be very suspicious of the system and would think they were being cheated. But he thought the system could be carried out by paying a percentage on each ton of cane. He favored this plan where it could be carried on. Here the question of the lack of water, until pumping plants were more gen-

erally established, would be a drawback; but that would soon pass. The system is practically in use upon Spreckelsville plantation and elsewhere; and under it the cane does better and looks better than under the present system. The price paid per ton of cane is \$1.15 at the Ewa plantation. The men make good wages and produces good cane. This is one of the solutions of our new conditions. He had very grave doubts about negro labor; had read the reports of negro outrages in the South, and his doubts were very grave. He spoke favorably of the Italian laborers in Louisiana.

Manager Olding said he did not think we had much choice. Negroes were especially good hoers, and in the cotton fields were sought after more than Italians and commanded better wages. In small communities the negroes gave little or no trouble. He cited cases in illustration both from North and South. The negroes in the South stand in much the same relation as to numbers as do the Japs in Hawaii. He feared trouble if we are forced to import more Japs. He said Mr. Horner was right about the Japs attacking those who set a rapid pace in work and cited a case where they had combined to kill a leader; he believed that when things had come to this condition it was time to look for a new class of labor.

Judge Hart said he believed the trouble would occur with any nationality. He did not believe the system of setting the pace would be successful. He quoted Senator Morgan, who was acquainted with conditions here, and who said, "For God's sake get rid of the negroes." It had been suggested by a local paper that negroes be brought to the islands and that a part of their expenses would be raised in the United States. This was true; he believed the people there who knew them would be glad to pay to get them out of the country. He asked those favoring negro labor to study a recent article by Senator Morgan, printed in the North American Review; that, he thought, would settle that question forever.

Dr. Maxwell said that a year ago he had submitted a series of questions to Editor Dimond of the Louisiana Planter. In reply he was informed that of laborers in the South the Italians were the best and demanded highest prices; negroes cannot keep up with them and besides the Italians give no trouble. The best negroes will not leave. It is only the riff-raff of New Orleans and other cities that are taken; the plantation negroes refuse to leave the country. The Doctor held that labor must be considered from two standpoints. First, from the planta-

tion standpoint, and, secondly, from the standpoint of policy. It is most desirable to secure laborers who will become citizens. It is an absolute necessity that the United States Government be made to understand that we are doing this. This applies especially to the small planters. The same principle is largely applied in Europe. What is wanted here is to get men who will become citizens and an integral part of the country.

Mr. Morrison asked why our present labor is not satisfactory? We now have nearly enough to fill our wants. Let us arrange it so we can keep what we have. The fact that we lose laborers is probably our own fault. We should be satisfied with present conditions.

Mr. Baldwin said the trustees for the past year had made great efforts to obtain European labor, but had failed. Endeavors had been made to get Americans under the co-operative system, but this had failed for the present, owing to the fact that the good times on the Mainland had raised wages. We should now adopt some plan to keep what we have, as there will be no more contracts. He believed strongly in adopting co-operation.

Mr. Morrison said the Japs prefer to live in small dwellings, while the Chinese prefer to herd together in large buildings. His plantation is putting up small houses. He thought the plantations should be made more attractive.

Manager Cropp of Koloa thought labor was being drained rapidly; it was going to Australia and elsewhere, especially were the Portuguese going to the United States and coming into Honolulu.

President Cooke said he was somewhat discouraged about Italians, when Mr. P. Isenberg writes from Bremen that Germany is draining all the countries of Europe for laborers for the beet sugar industry. He spoke of making the plantations more attractive and believed that such hospitals as they had lately erected at Lihue should be imitated.

Manager Olding said the improvements in laborers' quarters were now becoming more general throughout the islands.

On motion the recommendation of the labor report for a committee of three to report on labor was referred to the trustees for action.

At 12 o'clock the association adjourned subject to a call of the trustees.

REPORT ON CANE CULTIVATION.

(By Hugh Morrison, Chairman of Committee.)

To the President and Directors Planters' Labor and Supply Company: I have been so well assisted this season in preparing something on cultivation by Mr. Ewart of Kilauea that I have curtailed my own remarks to as limited a space as possible.

VARIETIES OF CANE.—Being quite recently around on the other Islands of the group, I was much interested in seeing the conditions of crops and mills and also the changes which were in process, or had already taken place in the kind of cane being planted where formerly nothing but the Lahaina was thought of. In Makawao, on Maui, and in Hamakua and Hilo, on Hawaii, the rose bamboo is now the favorite. On lower, irrigated lands the Lahaina still holds its own, although it has lost that richness and vigor in leaf and size of stick which we were accustomed to see in this variety, but wherever this cane has been displaced by another kind we find regret at the necessity which has compelled a change. A Hamakua planter said to me: "This season has seen the last of our Lahaina; we are obliged to change; it simply refuses to grow any more."

Ever since this variety displaced the native canes we have all been aware of its good and bad qualities. It stands among the best as regards quality and strength of juice: its fibre furnishes a hard, woody fuel, and on rich, deep soils it produces a very large crop; its faults are the habit of lying down all over the field and so decaying easily in wet fields, and after maturity it decomposes and dries up rapidly unless milled in time. This cane is known all over where cane is grown as yellow Tahiti, Bourbon, Crystallina, Cayanna, and so on. Wray, as far back as 1845, placed it, I think, second on his list. To the first rank he assigned a variety called Salangore. This fine variety is planted in Singapore, in province Wellesly, in Malaca, and here and there in the French possessions. Boname says it is larger and more vigorous than the Lahaina; the leaves are very large and deep in color, the stick more upright and furnishes a rich juice, clean and easy to work.

Krueger mentions, among many varieties, two especially as worthy of notice, viz., Cheribon and Luzier. In Java the Black, or Cheribon, is preferred before all others. This cane

had to fight its way, so strong were the prejudices of all classes against it. The rind is very hard, and before the age of powerful mills the yield of its juice was small. It has proven, however, to be not only juicier and sweeter than its competitors, but gave double the amount of sugar from a given area. Krueger says it is more generally planted than all the other varieties, and while very rich in sugar, is yet more capable of withstanding adverse conditions of climate and so forth, than any other kind of cane. Among adverse conditions, he mentions excessive wet at times, and prolonged dryness at other times. The Sereh disease has unfortunately compelled many to give this variety up, much against their will. The Luzier is a still harder variety and as yet less liable to the Sereh disease; with good cultivation, its juice and yield approach nearly to the Cheribon.

I have mentioned these varieties principally because I think some of them might yet serve our purpose in these Islands if cuttings were imported and planted with a view of taking the place of our Lahaina on uplands and soils so exhausted that a profitable crop for this variety can no longer be obtained. The Rose Bamboo, we know, has proven itself, in Hamakua and other districts, a fine, valuable cane after the Lahaina has run out, but the Bamboo is said to be exhausting to a soil, hence other kinds will eventually have to be found to take its place.

We are liable, however, to be too sanguine that a change from one variety to another will do all for us that we expect and desire. The near relationship of the cultivated canes is, I think, becoming more and more a fact to us, and occasionally we hear of some peculiar brand cropping up where the direct parent, or variety had not been known. In the Oloa district we were shown what is called there and in Kau the Whitney cane. This cane, we were informed, was obtained by the editor of our *Planters' Monthly* while he resided in Kau, by engrafting. We know the Bamboo variety has changed its character in some respects; its juice is purer and stronger, while the rind is more brittle, and makes better fuel than in former times. In these respects cultivation, climate and soil have brought it up to resemble the Lahaina in a great measure. The color of the stick, some say, has been modified, but the leaf, so far, preserves its darker color.

Climate, soil, age and cultivation have great influence on the color, shape and general make-up of a cane and determine

perhaps, these variations. It is not possible, therefore, to fix definitely for all time the group to which a cane may belong; neither are they named alike in the different countries where they are cultivated. While on this subject, I may mention that I obtained from Mr. Marsden a few samples of four or five varieties in November, 1895, with names attached as follows, viz: First, Striped Singapore; second, Big Tanna; third, Large Yellow; and fourth, a red variety; these were planted late and they gave but feeble results, but a ratoon from them is worthy of notice. Striped Singapore gave sticks $1\frac{1}{4}$ pounds per foot in weight, diameter 2 inches; 8 feet long. Juice: Brix 19.3; sucrose 17.6; purity 91.2. Big Tanna gave sticks 2 pounds per foot, 9 feet long; diameter $2\frac{3}{8}$ inches. Juice: Brix 14.6; sucrose 10.9; purity 74.6. Large Yellow gave sticks 1.3 pounds per foot, 9 feet long; diameter 2 inches. Juice: Brix 18.1; sucrose 15.2; purity 83.9. These canes were not matured when sampled (three months yet to grow), otherwise a richer juice would have been found. These varieties deserve, I think, to be tried on a larger scale. Other planters must have received samples about the time I did, but I have not heard further regarding them. Perhaps some of the planters present may have something to say in this matter.

SEED-EYES IN A GIVEN AREA.—We plant, usually, to suit the quality of the land, up to six feet or more, in rich, deep soil. We take an average row of any length; say thirty feet, and five feet between rows; this gives us 150 feet surface; then if we plant in this thirty feet furrow 100 eyes we may obtain on an average 40 per cent. shoots, some of which will die in the struggle for existence, but whether any of them die or not our crop will not be satisfactory unless secondary shoots, stronger and richer than the first, come up. This is the point; if we have the rows too near each other and the eyes too numerous in the row, we do the cane injury, but if we depend too much on our cane sending out secondary shoots and consequently plant too far apart, then we have too open a field and the yield is unsatisfactory. This is only too well known, I think, by all having practical experience of the work, and must be decided according to circumstances. For example, I observed on Paia and Hamakuapoko as many as 120 sticks to a 30-foot row, while on Makaweli we may plant as many as 150 eyes, or as few as thirty eyes in a 30-foot row, yet our final outcome will be about seventy-five to eighty-five sticks, and these give us as many tons of sugar per acre as the 120

sticks on Paia. It is therefore in the nature of the soil of the one place to send out a great many shoots of a smaller size, and the other place to grow a given average number of a larger kind, assuming that both places yield a given amount of sugar per acre. This subject has been again and again brought up for discussion. Years ago we planted far fewer eyes to a given area and gradually hearing and seeing enormous quantities on some favored field of our neighbor, we have added more and more eyes in our planting, until no doubt it has been very much overdone. We are liable to recede, however, too far in the opposite direction. If we could always choose the right seed, and have all the other conditions just as they should be, then I think, one-third of the eyes we now plant would do our work as effectively. Another point frequently argued over is, shall we use seed of one eye, or three or four, or the whole stick uncut? There can be proof brought forward in favor of each of these methods, yet this question, like the foregoing, is a very relative one indeed. Three to four eyes seem to be a mean between extremes so as to suit different soils where perhaps in special localities short seed of one eye, or an uncut cane would serve equally well, or perhaps better. In Dr. Sallard's work on cane, he quotes Stubb's experiments on this point, page 508, where in twenty samples, the uncut cane yielded a higher tonnage than the cut cane. I had an illustration of this on five acres, which I planted some time ago. The uncut cane at first was very irregular, but by eight or ten months it had gone ahead of the cut seed. There is no proof whatever that the eyes on the upper portion draw the nourishment from the eyes on the center or lower end of the stick. It is more rational to believe that each joint is complete within itself and the middle or lower end eyes being much older die earlier, or if alive, sprout slower than the topjoint eyes. Cutting the seed, however, is correct, and on an average gives a chance that all the slower eyes are not altogether. Hence if there is any missing the field is more uniform and the missing parts not all together.

IRRIGATION.—No operation connected with growing cane is so surrounded with antiquated notions on the one hand and prejudices on the other. The fact seems self-evident that some soils receive and retain the water easily; others again allow it to pass through, retaining scarcely any more than a layer of sand does. Some yellow, clay soils become sour if irrigated once a month; some red lands require it every eight or ten

days, and there are all sorts of graduations between. We hear of such and such a plantation making so many tons of sugar per acre; therefore the reasoning goes, with similar quantities of water, other places should do so likewise. Some of the main factors on irrigated plantations are depth and kind of soil, alluvial or not, temperature and freedom from high winds, or, in other words, climate. Our Islands are so small that a few miles changes our climate from rain to sunshine, from still, sultry weather to vigorous northeast winds. Statistics could easily be compiled showing how many cubic feet of water through a crop produce so many tons of sugar on this or that plantation, but the information, at best, would, in the hands of the unskillful, be worse than useless, while those who know what they are about do not require such information to guide them, unless all the other conditions are equally plain.

As a rule, cane requires a good deal of water; the land should not be drier for a foot down than, say, 25 per cent. to 30 per cent., yet the fact is sometimes forced upon us that cultivated cane is more a dry than a wet land crop. I think I can easily say, in many instances, excessive irrigation has leached instead of irrigated the soil. Prejudices in this line die hard, and where an interest in a subdivision of water exists, they will grow stronger rather than weaker. In this respect share planting has had an evil name long ago. On some of the larger places, such as Spreckelsville, it practically came to a dead stand-still from this more than from any other cause. It is evident therefore that a proportion of acreage is not always a just division for the amount of water, but the question is so full of loopholes that we go on to other parts of the subject; I am sure, however, that planting on shares on irrigated plantations will never be popular nor give the satisfaction in the future which it failed years ago to give in the past.

TRASHING, OR STRIPPING.—Most people in this country strip off the dry leaves; a few see no need of this costly and disagreeable job; it is not done in Hamakuapoko, Makaweli nor Paauihan, and it is generally omitted in other sugar-growing countries. It is but fair to add that on very dry plantations the reasons for thrashing are few, while on the wet lands there are apparently good reasons for so doing. This question can be profitably left to those interested; where it is found beneficial it will be done, and where it gives no advantage it will be left undone.

MANURES.—As Dr. Maxwell will no doubt do this subject

justice, I only wish to say a few words about it. The question of restoring to the soil what had been taken out by crops was not very well known formerly and it is doubtful if it is understood by the majority of planters today. Deltail and Boname went into this subject, but Basset, following in their train, put the matter into a more logical position. From a given weight of matured cane and leaves certain proportions of nitrogen, phosphoric acid, potash, etc., were obtained as an ultimate analysis; and from this he naturally concluded the weights of each component could easily be calculated for any crop, large or small. This he calls fertilizing by restitution. The idea seems rational enough that if we return to the soil what we have taken out, and in the same condition, the soil would be as good as it was before it produced a crop. It is an old advice and in some cases a good one, that we return to the soil the begasse and the leaves and allow the bulky mass a sufficient time to decompose and become absorbed by the soil. This requires much labor and plenty of land, so that the rotation of planting is a good many years in coming again to the same field.

In ratooning a field I have in many instances plowed under the leaves and added nitrates and lime, and had good results from them, more, I think, from the mechanical effect than from their chemical properties; but we have been informed from some of our own planters, as well as from those in other sugar-growing countries that a surer way does not exist of propagating borers, and other injurious insects, while others urge the destruction of all leaves and decayed cane in order to keep out the many obscure sicknesses and diseases usually found about cane-fields. If it could be done, a better way would be to compost all such matters until it was fit as rotted manure, to be transported and placed on our fields, as we do now with stable manure.

Burning the leaves in the fields destroys all the nitrogen, while the ash which remains is invariably swept away by the wind, the little that remains is generally very insignificant, even in those parts where there are no constant winds. Leaves brought from the field to generate steam in the mill give some ash which is recovered—the nitrogen, of course, in this case is lost just as well as if they were burned in the field. When newly cut, the weight of the top, green leaves and all the leaves either stripped off or which fall off during growth, is said by Basset to be 67 per cent of the weight of the cane ready for the

mill, and contains 70 per cent. of all the nitrogen and about 72 per cent. of the mineral matter used by the entire plant. Could it be possible to return to the soil the elements taken up by the cane and the leaves, we would have for every 2,200 pounds of cane 420 grammes of nitrogen and 3.66 kilograms of mineral matter, and from the leaves which came from these 2,200 pounds of cane 950 grammes nitrogen and 9.5 grammes of mineral matter, a total for cane and leaves, 1.37 kilos nitrogen and 13.25 kilos mineral matter.

If we multiply all these figures by $6\frac{1}{2}$ we will have a little over seven tons cane per ton of sugar, which might nearly represent our requirements; then the nitrogen and the mineral matter would be for every ton of sugar made, as follows, viz: $1.37 \times 6\frac{1}{2}$ equals 8.9 kilos nitrogen, equals 19.58 pounds; $13.25 \times 6\frac{1}{2}$ equals 86.12 kilos mineral matter, equals 189.46 pounds. But as nearly all plantations burn the cane leaves in the field or elsewhere, they lose, according to these figures which I have taken from Basset's work, page 608, about 14 pounds nitrogen for every ton of sugar made—from the burning of the leaves only.

Dr. Kruger, in one of his Java reports, page 107, says the value of 100 kilos, or 220 pounds, of the dried substance, in leaves, would be worth 13 centimes for its contained nitrogen, and in his work, "Sugar Cane and Its Cultivation," page 218, referring to cane leaves, says their worth is very small as mature, even taking their nitrogen and the mineral ash into consideration. In 100 kilos dry substance, he puts their value at 18 pfennig. If green leaves are dried in the sun for three or four weeks they lose four-fifths of their weight and they lose enormously in their value as a fertilizer; and it is only in the possible application of the first strippings, which usually contain a notable proportion of green, undecayed leaves, where any material benefit from their nitrogen and their mineral substances might be taken into consideration.

Boname says, "The ash from a given quantity of green leaves may contain as much as 11 per cent. or 22 per cent. of potash, but from the ash of withered, dry leaves only as much as 2.63 per cent. to 5.77 per cent. of potash, both expressed, of course, on the ash of the dry substance. It is therefore in the growing period when the leaves are in perfect vigor that they are richest in nitrogen and potash, and when their functions are performed, their elements grow less and less, while the proportion of silica augments as they grow of less value to the

cane, and eventually they fall off altogether. The greater portion of the alkaline salts have either returned to the cane stick, or by rains or dew been diffused out and returned to the soil."

The use of commercial fertilizers is extending very much over the Islands. Lime is now recommended where formerly its place was taken up by large doses of superphosphate, a useless expenditure, in many cases. From my own experience I can trace but little benefit in our land from the use of phosphates, either soluble or not, and associated with other elements or applied alone. Potash alone, or with guano, gave no marked effect, but if followed by an application of nitrate of soda or sulphate of ammonia, rendered much assistance to the growing crop, and in adding nitrate soda I have found best results if accompanied with carbonate of lime. Two applications at different times are better than one, and in our circumstances I prefer the warmest weather, say, August and September, for the last dose, and have had good results as late as the middle of October, cane being cut in January.

ROTATION OF PLANTING.—By this is meant how long can a field be profitably under cane, plant and ratoon, before it is plowed up and replanted afresh? A field is planted, say, in August; grows until the second November but it is not cut until, perhaps, May; this is practically two years. If it is ratooned it may be cut again in April or May; this makes three years that the cane has occupied the soil, but if, in place of ratooning at once, after the plant, the field lies idle until, say, October or November, and after that cultivated and cut, say, the second April or May, then the cane has occupied the soil four years, but in actual growth only three and a half years. Now the point is which method pays best, and which, from an agricultural point of view, is best for the land?

This question is very important where irrigation is practiced. It will be noticed that the same amount of water is used, or very nearly so, whether we take a short, or, as we may call it, a long ratoon, because practically no water is used on the long ratoons during the first six or eight months, whereas on the short ratoons, water is used just as soon as the trash is burned. Now we all know how beneficial it is for the soil to have a rest, and in the case of irrigated lands to become dry and activity to cease; this is accomplished for a short period in our long ratoon system, but it is not in the short ratoon. The average yield per annum and per acre is therefore in the one case—the sugar obtained from the plant and the short ratoons,

divided by three, and in the other, the sugar of the plant plus the long ratoon divided by four. In our case (Makaweli plantation) the four years' rotation gives the best results, and is more profitable in every way, while it is making the best use of the land, and the water of irrigation. Plantations regarded from this standpoint show at a glance what results can be expected on an average from their total area, or circle of land under cultivation per acre.

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 REPORT ON CANE CULTIVATION.

(By Geo. R. Ewart.)

To Hugh Morrison, Esq., Chairman of the Committee on Cultivation:—Our system of cultivation is quite different to most places on the weather side of the Islands, as we have to irrigate, and we have a little more bad weather than anywhere else. Being the most northerly point we are exposed to the North and North-west winds as well as the usual trade winds; the former we dread the worst, as they have a blighting effect on growing cane. A 24 hours' wind from the north or north-west will make cane appear as though it were drying up for want of moisture. It causes the change whether it is dry or wet weather. Fortunately such winds come only in the winter time. We have to irrigate in spite of the fact that we have an average yearly rainfall for the last 14 years of 72.17". Most of our rains fall during the winter months, when the temperature is low, and do us no good.

We store water, have three reservoirs of an area of over 60 acres, and an average depth of 27 feet. Our soils are of the "yellow and light red" varieties and an average depth of about 8". And while here, let us ask does it pay to cultivate deep on thin soils? We are told that yellow and light red soils do not retain moisture well; that being so the subsoils retain less and besides having no capillary power will allow the water to run through and it is lost to the plant. We have any amount of evidence that that is so, for all depressions and gulches commence to run water as soon as we begin to irrigate and drain ditches have to be cut in all such places. In dry summer weather (and that means hot weather with us as wet weather means cold) we cannot get water fast enough on our cane to get out all there is in the land. What with the drainage through the soil and evaporation, both through the cane and ground, there is no fear of doing any harm by water. We find

that with deep cultivation (that is using the steam plow cultivators to a depth of say twenty inches and cross cultivating it) the land will take in more water, but as it runs through it, it is wasted.

If we could regulate the amount of water to a nicety, as they do at the experimental station, it would be all right, but you cannot do that, as you cannot depend on the watermen to put on just so much water, they will fill the furrow. The only way to prevent it is not to furrow deep, and we are doing it for two reasons: one, to reduce the quantity of water put on at one time, and the other to give the seed as deep a soil bed as we can so that some of the roots will be underneath the seed; we find that none of them penetrate the subsoil, they are all lateral from the seed, so where does deep cultivation come in, when the subsoil will neither hold the moisture nor the roots go into it? The more you loosen the subsoil, the more water it takes to fill the furrow and the more runs to waste. I may state I know of no plant growing here that has roots growing in the subsoil. We always plow to take up a little of the subsoil so as to increase the quantity of soil by each plowing. We commence plowing in the fall and harrow each field immediately afterwards so that when we come to plow it the second time before planting we find that the land well broken up, and the second plowing and harrowing leaves the land clean and well pulverized. With new land we cultivate well before second harrowing. Land having maniana (Bermuda grass) growing cannot be harrowed clean, we have to hoe it out after we furrow. Our furrows are from 5 feet 6 inches apart.

Before planting we put in the furrows 800 pounds to the acre of pulverized mudpress cake and ashes. It analyses, phos. acid, 3.16 per cent.; potash, 4.88 per cent.; nitrogen, 1.53 per cent. Analyzed by Dr. Averdam of Honolulu. We then run a single tined cultivator or subsoiler through the furrow mixing up the mudpress cake and ashes with the soil. Seed we place lengthwise in the furrow and overlapping a little but care being taken that the seeds do not touch each other, in case one seed spoils and affects the other. Cover lightly, following up with watering immediately and watering afterwards according to the weather. If very dry, water again in five days and again in seven to eight days. Our big cane we try to water every twelve and fourteen days. We fertilize after the shoots are up say twelve inches with soluble fertilizer containing phos. acid, 9 per cent.; nitrogen, 7 per cent.; potash, 2 per cent..

putting 500 to 800 pounds per acre. The latter amount in two applications and in very poor places adding more. Sometimes nitrate of soda or sulphate of ammonia.

SEED.—We find our best seed is good plump plant cane; there are less misses from that kind of seed than any other. We usually cut, say, plant cane this year and the ratoons of the same cane next year, fertilizing of course, and if the stand is good after the second cutting we fertilize again and use it; but we always find we do better from the original plant cane than from either of the ratoons.

STRIPPING.— We do this once and in gulches oftener. In dry seasons it does fairly well but it has one big disadvantage with us, and that is, the amount of dry leaves that stick tight to the bottom of the cane, which cannot be knocked off with a knife, making it bad for milling and also more costly for cutting.

RE-PLANTING.—Re-planting, taking the plant cane we have just taken off, the first field, 350 acres, cost 13 cents per acre to re-plant. Commenced it June 14th. Second field, 337 acres, commenced July 14th. Cost 29 cents per acre. Third field, 206 acres, commenced August 16, costs \$1.17 per acre. A great deal of the last field was not planted until October, as we had to wait for rains. The above showing is pretty much in keeping with our other years. Only we have some cold wet seasons when cane won't come up good, even in June. Regarding early or late planting, with us all fields planted after August require more care and are a source of greater anxiety than fields planted in June, July and August. Fields planted before the middle of June are liable to tassel in November; planted after the 15th we never have any tassels. So we begin the middle of June and try to finish in August.

MATURITY OF CROPS.—As is well known in agriculture, crops mature earlier on light, thin soils than on deep heavy ones, and so it is here. All kinds of cane that we have tried deteriorate just as soon as the full bloom of the tassel is gone. The Yellow Caledonia and Rose Bamboo start in to send out young shoots from the stool, so that a field of Rose Bamboo ratoons of 300 acres cut in March looked like a field of young cane growing, the men only cutting the mature sticks and leaving the young shoots. The difference in the same field in sucrose and purity, taken off in December and March, is as follows: December—Sucrose, 16.28; purity, 91.5. March—Sucrose, 15.73; purity, 87.3.

The piece taken off in December was only a small portion of the field—some eight or ten acres; the March lot was 300 acres. Lahaina does not send up any young shoots after tasselling; it simply dries up. The wetter and colder it is the quicker it goes bad and it is only in very good weather that we have any lalas. Rose Bamboo and Yellow Caledonia are both more liable to be turned over with wind than Lahaina, especially the Rose Bamboo, the wind turning it over roots and all, and, like all forced and quick-growing plants, the sticks are long and spindling and lie down a great deal. Yellow Caledonia stands up better than Rose Bamboo. Both Rose Bamboo and Yellow Caledonia are quick in starting, the shoots showing above ground earlier than Lahaina, growing vigorously right along; keeps a good color all winter and appears to stand the cold weather much better than the Lahaina. Altogether a very pleasing cane to grow, but terribly disappointing when you come to weigh it and put it through the mill. Rose Bamboo grinds badly in our mill; it seems to re-absorb the juice no matter how you run the mill, fast or slow, the hydraulic heavily weighted or not. Perhaps it would do better with rolls of smaller diameter, as the point of contact would be finer. My opinion of the two varieties is that they require a deeper soil than we have, and a longer time to grow. Their success in the uplands of Hamakua and Kau would indicate that, as they get such conditions, viz: deep soil and long growth. When we first got Rose Bamboo and Yellow Caledonia they were from two to three weeks later in tasselling than Lahaina, but now they tassel at the same time.

RATOONS.—Ratoons can never be a sure crop with us. Our last crop of plant cane was perhaps the best ever taken off here and our ratoons one of the poorest. You will notice the rainfall and temperature of January, February and March, 1898, was not cane-growing weather; a great many of the stools so rotted that we deemed it better to take off what we could than to cut back and go in for long ratoons. From experience we have never been able to make long ratoons pay. One thing we notice that whenever for any reason our plant cane does not grow well from late planting, bad weather or any cause whatever, our ratoons are better than the other fields that have had the normal crops. It would seem as though the land was not able to sustain any more than so much whether plant or ratoons, and that, in spite of any fertilizers you can put on.

The weather this last spring was very favorable for ratoons; we had a dry winter and for the first three months of this year the mean temperature was 1.52 degrees higher than the three months of last year, and our ratoons never looked so well as they did in the spring; they have got a good start and we ought to have a good crop. So to us it would appear that long or short ratooning is more a question of soil and weather. We must take off our plant cane early, as it deteriorates so soon after tasselling, and the wetter and worse the weather the quicker we ought to do it; so that with us we want good weather to ensure us a good start for our ratoons.

We cultivate our ratoons as follows: As soon as the trash is burnt off we start five plows between the furrows; then when the young cane is high enough we fertilize with 500 to 800 pounds of the same fertilizer that we use on the plant cane and with a double mouldboard plow we throw the dirt towards the cane, afterwards hoing it and watering between the cane.

It takes a great deal of water doing it that way in our thin soil, and we think that hilling up in the furrow would be better, and we are going to try that method next year. The last few years we have cleaned out all the gulches, cutting deep ditches up through the lowest parts, getting down below the boggy places. Limed them good with from four to eight barrels per acre, according to the condition of the place we have planted them, and have had good success. Some parts, where it was very sour land, the stools of the ratoons have rotted the first time, but cultivation improves that.

I may state that with us we must carry out the old dictum in irrigation, viz: "Irrigate from the highest points and drain from the lowest." Every little hollow or gulch that we plant we must put in a drain ditch. In some cases we catch the drainage water and use it over again, and in one gulch of about a mile long we use it over three times. Liming the land is good; we are trying some experiments and will be able to give some data after our crop of 1901. We find we cannot crop continuously; no amount of fertilizer (mineral fertilizer) applied will give us a paying crop, say, after the first two crops; so we let the land to be planted lie over one year, applying all the refuse from the mill, waste molasses, surplus trash, sweepings from the cane-carrier, blood from the slaughter-house, stable manure and night soil from the quarters—anything and everything that will improve or make soil we put on the poor places in fields nearest to where the material is handy. If we had

stable manure to cover all our lands we might, with mineral fertilizers, plant them right along; as there seems to be nothing to equal a dressing of stable manure plowed in and mineral fertilizer applied after the cane comes up. But stable manure, like trash from the mill, is very bulky, making it very costly to handle anywhere but near to where it is made.

SOILS.—Soil chemists say that the bacteria that prepare food for plants are active 18 inches from the surface; that being so, the question of crops ought to be one of arithmetic on the Islands, all conditions being equal—depth of soil, heat and moisture. Dr. Maxwell, in his work on “Lavas and Soils,” page 185, gives the following table:

	Approximate No. of Acres.	Yield Sugar per Acre.
Dark red soils	30,000	10,411 lbs.
Yellow and light red soils .	32,000	6,291 lbs.
Sedimentary soils	20,000	10,301 lbs.

Most all dark red and sedimentary soils are deeper than 18 inches, and I think in tropical countries animal life goes deeper than in temperate ones, as cane and grass roots will be found at a greater depth than 18 inches in dark red soils. So we may take it that as 18 inches and more of good soil is to 10,367 pounds of sugar (average yield of dark red and sedimentary soils) so is any number of inches to the answer. Yellow and light red soils produce more in proportion to the depth of soil than the dark red, etc., soils, as, no doubt, the cultivation has to be more thoroughly done; that will perhaps give food for thought to some folk who think and say that cane raising is only a matter of fertilizers. Granting that the first six inches of soil is better than the next six inches and so on, there is still a big difference in favor of the yellow and light red soils; in spite of the fact that dark red soils have the better climate on the lee side of the islands.

I would suggest that there be experiments made on all kinds of soils on all of the islands supervised by the Experimental Station, the same as agricultural experimental stations and colleges are doing in other parts of the world. The work could be done by the plantations the same as farmers are doing; but the directing and tabulating of results should be done by trained men. This thing of having an experimental station where conditions of soil, heat and moisture are altogether different to where the greater part of the islands crops are grown is of little use. It is known that Ewa crops are large per acre;

what we want to know is, can it be done or approached on yellow and light red soils? If so, how?

Kilauea Plantation, Kauai.

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REPORT ON LABOR.

TO THE TRUSTEES AND MEMBERS OF THE HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

GENTLEMEN:—The question of labor is undoubtedly the most important one confronting the Sugar Planters of the Hawaiian Islands today. With the Contract System abolished, and the immigration laws of the United States extended to this country, the question will become even more serious. Under these laws assisted immigrants cannot be admitted, and our source of supply will be limited to such persons as are willing and able to pay their own passage and take their chances of securing employment after arrival here. With the inauguration of a large number of new plantation enterprises within the last year, and the contemplated extension of many of the older estates, a large additional force of laborers, over ordinary requirements, must be brought to the country within the next two years. Just how this is to be accomplished is a question that this Association will be called upon to solve, and its satisfactory solution will require a large outlay of time, money, and energy.

Labor is the corner stone upon which the edifice of our great industry rests, and the foundation under that corner stone (namely, the source of supply) needs strengthening in order to carry the enormously increasing load incident to the rapid expansion now taking place. Your committee prepared and forwarded to all the plantation managers, a circular letter and list of questions, as per copies attached. It was their hope that the questions would receive more than ordinary attention, and that a large majority of managers would favor the committee with a full statement of their views and suggestions relative to the maintaining of our labor supply. We regret to say that the responses have been few, and, for the most part, unsatisfactory. Possibly the reason for this is, that they are in the same condition of mind as your committee, viz: having no solution to suggest which is satisfactory to themselves.

The manager of one of the largest plantations in the islands writes, in regard to this, as follows: "I suggest that, in view

of the amount of thinking out that this question requires and deserves, a committee of three be appointed by the planters, to study up this question and report, and suggest, within six months, such plans for the solution of our labor problem as may seem feasible. I think this committee should consist of one director of the Association, one layman who thoroughly understands the country's needs, and one plantation manager."

Referring to the foregoing, it would seem to your committee a good suggestion, provided the members of the committee suggested could devote their entire time, or a large portion of it, to the study of this question. Owing to the fact that the questions asked of the managers have not been universally answered, ten of the managers of the largest estates making no response at all, it will be impossible to submit any statistical report upon the existing conditions, which would be reliable. It would be a case of estimate and guess work at best, and therefore of little value.

It would seem, however, that the questions of sub-letting small areas to independent planters, and of cultivation on a profit-sharing basis, are receiving a great deal more attention than formerly. No less than 18 managers have reported as having existing arrangements on these lines. Many more have considerable areas under contract for cultivation with independent labor.

In this connection, Dr. Maxwell will, during his contemplated visit to Queensland, thoroughly investigate the small farming system which is so extensively practiced there, and we trust that his report upon this subject will be of material value and aid us in the solution of this vexed labor question.

During the visit of Mr. Ray (Private Secretary of Senator Cullom) to the islands, in July last, he asked Dr. Maxwell to prepare for him a statement in regard to the "State of Labor on the Hawaiian Islands." The statement asked for was prepared and is a very interesting document, and, with the consent of Dr. Maxwell, we append same to this report.

We also hand you herewith letter of Mr. E. E. Olding, Manager of the Kohala Sugar Co., in which he advocates the importation of negro labor from the Southern States. Also letter of Mr. Andrew Moore, Manager of Paauhau Plantation, containing suggestions relative to the employment of day laborers which we commend to you for consideration.

Very truly,

E. D. TENNEY.

Member of Labor Committee.

STATE OF LABOR ON THE HAWAIIAN ISLANDS.

During the earlier days of sugar production labor was furnished almost wholly by the native Hawaiians. As the industry developed that source of supply became insufficient, and its leaders had to look beyond the borders of the islands to meet the requirements. The most immediately available sources of labor were China and Japan, and certain of the dependencies of Portugal; consequently labor was sought in those several countries.

Due, on the one hand, to the great expense involved in moving labor from any of those distant lands to Hawaii, and the inability of the laborers to bear the cost of their own transportation; and due on the other hand to the guarantees of service, support and protection required by the governments of those countries whence the labor was to come, the so-called "contract-system" was established.

The main purpose of that system of contract was to furnish guarantees to the home governments of the imported laborers that their peoples should have occupation, provision, and personal care and protection; and likewise to give security to the authorities and employers in Hawaii that the great cost of the importation should be worked out during a specified length of time. Such a system of contract, in order that its several conditions should be operative, had to contain a special provision for their enforcement, and that necessity led to the adoption of a "penal clause," approved by the authorities of the chief contracting parties.

From the foregoing considerations it appears that the nature of the contracts was such as it was of necessity; and it further appears that, at the time of its origin, the contract system was indispensable in order to procure the labor needed. The specified duration of a contract being three years, at the end of that time the imported men became free laborers, from which fact it is at once seen that it was only a matter of time when the number of free laborers should exceed the number under contract, even if the importations were maintained. Consequently an ample supply of labor, absolutely free in its action, was being evolved through, and by means of the contract system, without which those free laborers could never have found themselves in their present fortunate conditions.

Having fulfilled the provisions of their contracts, those free laborers could choose their own course. The greater part con-

tinued to work where they had previously done, or moved on to other plantations. Others went to labor on coffee and rice plantations, or adopted small pursuits of their own. During the more recent years, and at this time, daily increasing numbers of the ex-contract men are growing cane on their own account by reason of arrangements made with the plantations, and are therefore reaching the state of independent planters. These independent small planters have evolved from the free laborer, as the latter came from the contract-man, and whether it shall be shown that the system of contract is now no longer necessary, or not, it is due to that system, under whose conditions they found it possible to enter this country, that the large bodies of Asiatic and other peoples enjoy their present state of independence and well-being.

Concerning the relations that have existed between contract laborers and the employers or managers of plantations, and the operation of the penal clause, it has to be said that but few disturbances have arisen. The representatives of foreign governments located in Honolulu have aided in enforcing the fulfillment of the contracts on the part of the laborers; and the Hawaiian authorities have been prompt and strict in redressing any harsh treatment of the laborers by under-officials on the plantations; which facts are attested by records of the law courts. Whilst the penal clause has been exercised where contracts have been violated, yet no harsh treatment of the men, such as has been recorded in the Southern United States, has been in any instance overlooked by the governing authorities of Hawaii.

The statements so far made, whilst applying largely to the Asiatic peoples, do not apply solely to them; and for the reason that other nationalities have also come into the country during the period spoken of. A brief table giving the status of the population and labor is furnished by data taken from the last census:

POPULATION AND PLANTATION LABOR.					
1897	Hawaiians	Chinese	Japanese	Portuguese	Other Foreigners
Population . . .	39,504	21,616	24,407	15,191	8,302
Labor	1,497	8,144	12,068	2,218	756

These data show that great numbers of Portuguese and of other white peoples have come into the country, but that relatively few of them have remained in agricultural work. This result has been, in the main, due to the greater capabili-

ties of the white peoples, which enable them to pursue lines of skilled labor, and to more readily adopt independent pursuits. The factors which must determine the further introduction of white labor into agricultural work in this country are climate, relations of the laborer to the management, and the inducements offered.

Concerning the ability of white laborers to bear outdoor work in this climate, it has to be said that the Portuguese, and some smaller numbers of Germans and Anglo-Saxons, who have worked on plantations, have not only borne the work, but have rendered more, and a higher class of labor, which is attested by the higher rate of compensation they have received. This statement can be compared with the labor rolls of numerous plantations employing mixed nationalities. Also the more taxing indoor work of the iron foundries and machine shops of Honolulu is mainly done by white labor, chiefly imported from the mainland. At this time a complete sewerage system is being put in throughout the streets of Honolulu. The contractor is from San Francisco. This man brought some twenty white laborers from California to do the heaviest work in laying down the pipes. When asked what price he was paying his white labor, the contractor stated "\$3.75 per day; and they are cheaper than those Chinamen that I engaged here, and pay only \$1.40 per day." The white men, who were sitting at lunch, were next questioned, and as to "how they bore the climate." They replied, "We can do any work here. Why in comparison with Fresno (Cal.), where the boss had us before we came here, this is Arctic!" Every day, on the streets of the city, white men are performing labor that is vastly more exhausting than the work on plantations, and arrivals of artisans from the mainland are frequent.

RELATION OF LABORER TO MANAGEMENT.—Regarding "relations of the laborer to the management," in the first place, it has had to deal chiefly with subject races, and peoples ignorant both of the work they had to do and of the language through which they were directed. It was, and is still, impossible to treat with and manage crude Asiatics and foreign whites as English-speaking laborers can, and have to be managed. Of necessity, those ignorant contract men were and are put into gangs, and overlooked by an under-overseer, who acts under instructions from a higher overseer, or the manager. White labor, and especially English-speaking labor, will not fall into the gang system, to be run with Asiatics, or even in gangs of

themselves, and to be constantly followed by the overseer. And it is not necessary, nor it is less necessary that English-speaking laborers should be handled thus. They can receive more direct instructions from the management and carry them out without the constant oversight of an overseer, who may be of the same nationality, and of no greater intelligence, than themselves. The English-speaking laborers are also more capable than crude Asiatics of making contracts with the management to do certain work at so much per acre, or by the job. Further, such white laborers have open to them the opportunity to gradually become independent planters by the same means that have enabled the Asiatic free laborers to do so. It is along the latter line that the possibilities offer for white, English-speaking, labor to become engaged and settled in the chief agricultural industry of the islands.

INDUCEMENTS TO WHITE LABOR.—Bearing upon the question of the "inducements offered" to white labor, in the first place, the compensation paid to free laborers may be considered. In a brief report on "Labor Conditions in Hawaii," made by the writer six months ago (See Year Book of the Department of Agriculture by Secretary Wilson to President McKinley, page 578) it is stated that the average wages per day of all laborers is equal to that of the mixed labor of Louisiana; and that the wages of unskilled Portuguese labor on stated plantations was 43 per cent. greater than that of the Asiatics. Since that date wages have risen all round on the islands, and today the average wage of all nationalities is not less than 80 cents per day, whilst plantations exceed \$1.00 per working day.

The free laborers have further the opportunity to become individual planters, growing cane to be sold at stated prices per ton to the large plantations; or, according to several forms of a system of profit-sharing they may co-operate with the plantations and receive such share of the results as may have been mutually decided upon. To become independent planters, growing and selling the cane to the plantations, is the more popular system with the men, and it is extending with considerable rapidity. The reason of the greater popularity of this system lies in the circumstances, that the men can work not only when they feel inclined, but when their labor is most effective. Further, they are able to engage the help of their families at any season when the work is pressing. Moreover, this system contributes to the spirit and possibilities of independence, much of whose results are good and praiseworthy.

HOW TO BECOME A PLANTER.—Concerning the means by which free laborers have already become planters, and through which means free labor of all nationalities can continue to do so, an example is given in some detail, which sets forth the principle and serves as an illustration of other cases: The Hilo Sugar Company encouraged and entered into agreements with free laborers to grow cane on its own and adjoining lands. Such lands as could not be cultivated by the plantation with horse labor were let free of rent; other lands are rented at from a nominal price up to \$8.00 per acre, as determined by the value of each specific lot. Where necessary, which is so in most cases of free laborers entering upon this system, the plantation makes advances of money to meet the living and other expenses of the small planters during the period that their crops are in growth. These allowances are refunded when the crop is harvested. The crop is purchased by the plantation according to a scale of prices which is based on the quality of the cane and the prices of sugar in New York, or in other cases according to conditions, all of which are set forth in drawn agreements, approved and signed by the growers and manufacturers of the cane. Forms of these several kinds of agreement can be readily obtained, and have already been furnished to authorities requiring to see and to use them.

Relating to the example now under consideration, the writer was present in the office of the said plantation four weeks ago when the manager was renewing contracts, and making advances of money to the planters upon the growing crop. Some thirty of those planters were there. The appearance of thrift, respectability, and air of business responsibility of those men was nothing short of impressive when it was remembered that every one of them had arrived as contract men a few years ago, and without a dollar to them. In the course of conversation the manager said, "Yes! I paid out \$90,000 to those small planters last year, and their production is still increasing." He said further: "Oh, yes! they all seem very content, and even proud of their position: And they may well be! They not only live well, but some of them have balances of \$1,000 to \$2,000 to their names; whilst others make trips home to Japan in good style to see their friends. They all turn up again, though." As those men were leaving the manager's office, the writer noticed that most of them were riding their own horses or mules.

OFFER FREE TO ALL.—The ways that have been opened to

existing small planters are open to white laborers of all nationalities upon those conditions that are necessary to make the independent planter system, and other co-operative systems, a success. The position of relative independence and security, and the compensation which have come to numbers of those peoples who came into the country through the contract-labor system are offered to all free labor entering the country, and at once, and without the preliminary period of enjoined service through which contract laborers have worked up to their present state. Only, all laborers, independent of nationality must subscribe to the requirements of the system, and honestly stand by the conditions of the agreements. This has been faithfully done by the small planters generally; and probably for the reason that they are fully aware that but for the liberal conditions offered by the plantations the system could not have come into existence. It is not for one moment claimed, however, that the plantations have been moved in this matter by any than business considerations; nevertheless, the results to the small planters have been just as beneficent as though the undertakings had proceeded from motives of philanthropy.

In the opinion of the writer, there are advantages offering to white laborers, along the lines set forth, such as do not obtain in older countries. His familiarity with the state of labor in England, in European countries, and in the middle-western and southern States of America causes him to believe that the farm laborers in those old countries, and in Nebraska, and the States of the South have not such chances to reach an independent position, and to lay up money, as are at this time being used and enjoyed by men who were first contract laborers, then free laborers, and now relatively independent planters.

NOTE.—In affirming a title to speak upon the labor conditions of this country, the writer merely adds that his position has compelled him to become familiar with the affairs of the plantations, all of which he visits annually.

WALTER MAXWELL.

Special Agent for Hawaii of the U. S. Department of Agriculture.

REPORT ON MANUFACTURE.

TO THE PRESIDENT, TRUSTEES AND MEMBERS OF THE HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

GENTLEMEN:—Your committee on sugar manufacture submits the following report, the statistics of which are compiled from replies received to circulars mailed to all of the plantation managers.

These replies, although not numerous, were very full as a rule, and your committee takes this opportunity of expressing its obligations to those gentlemen, who did reply, for the interest shown.

GENERAL MILL STATISTICS.—The following table, while incomplete, is taken, from such factory reports for 1899 as are at hand, of some of the best mills in the country. It embraces the most particular points of the mill work of 14 factories where the extraction is by means of rollers; and from one sugar house where diffusion is still practiced.

No. of Mill	1st Mill Purity Normal Juice	Per Cent Dilution	Purity Mixed Juice	Extraction Per Cent Sucrose	Per Cent Sugar in Bagasse	Per Cent Sugar in Press-cake	Purity Waste Molasses	Losses on Sucrose in Cane
1....	96.5	15.2	95.7	94.26	4.36	4.16	45.5	Per cent.
2....	84.6	10.7	83.9	88.	5.7	8.7	43.	18.41
3....	94.4	12.6	93.9	92.69	.....	8.22	33.2	.....
4....	94.9	14.1	93.8	93.77	4.17	10.87	44.3	.....
5....	94.7	17.1	94.1	93.05	.....	9.25	47.9	.....
6....	94.9	9.2	94.1	93.31	4.39	11.39	45.4	.....
7....	95.1	13.5	94.	93.93	4.27	6.28	41.5	.....
8....	94.07	8.8	92.5	91.34	5.5	5.3	60.5	.....
9....	83.8	18.01	82.9	91.11	5.71	10.6	38.9	16.9
10....	90.3	14.8	90.1	91.76	5.7	8.4	33.3	17.96
11....	91.63	10.13	89.7	93.	.....	5.1	.....	.....
12....	87.63	5.96	86.64	91.44	.....	.....	38.96	15.83
13....	87.5	19.57	85.69	93.3	4.41	7.43	44.5	16.7
14....	89.69	19.47	86.76	92.52	5.18	8.62	39.19	17.34

AVERAGE WORK DIFFUSION MILL:

D 86.9 23.6 85.2 97.25 38.1 10.44

Where the spaces are marked thus ".....," no figures were handed in.

Although the majority stand fairly well together as a whole, there is sufficient range in particular instances, other work being good, to give us pause. The following percentage variations are noted in the returns from roller mills:

	14 Mills % Range—	13 Mills and Less % Gen'l Average.
Purity Normal Juice.....	83.8 to 96.5	91.54 13 mills
Dilution	5.96 to 19.57	13.05 13 mills
Purity Mixed Juices.....	82.9 to 95.7	90.54 13 mills
Extraction on Sucrose in Cane..	88. to 94.26	92.38 13 mills
Sugar in Bagasse.....	4.17 to 5.71	4.91 9 mills
Sugar in Press Cake.....	4.16 to 11.39	7.97 12 mills
Purity Waste Molasses.....	33.2 to 60.5	43.08 12 mills
Loss in Manufacture.....	14.34 to 18.41	16.69 6 mills

Conditions, however, vary so much with locality that it is not proper to draw comparisons. Methods of arriving at extraction differ; machinery differs; quantity of cane handled by the same sized plant in different locations vary, etc.

At the same time it is both a natural and a probable inference that something is to be learned in manipulation from a factory whose waste molasses is of 33.2 per cent. purity; from another where powerful machinery and probably constant vigilance give an extraction of over 94 per cent.; and that it would be profitable to look into the methods by which an average press cake is obtained with a sugar content of a little over four per cent.

The question of juice purity is well worth pondering over. The planters are aiming:

(1) At the production of canes with the highest percentage of sugar.

(2) At the grinding of those canes when in their best condition.

With regard to the first, your committee ventures to say that in the future there will be much greater interest attached to this subject than now, and that its attainment will be based on the study of that part of manufacture in its fullest sense which begins out of doors.

For illustrating the second a table is placed below giving the months in which the highest juice purities were recorded in 1899 on ten plantations, from which data pertaining to this were received. Of these Estates two each were on Oahu and Maui, and three each on Kauai and Hawaii. The two best months were taken from each plantation record, thus making twenty readings distributed among the months of the grinding season, thus:

MONTHS OF BEST JUICE PURITY.

January has 0.	May has 5.
February has 2.	June has 3.
March has 4.	July has 2.
April has 4.	August has 0.

As all of the group are fairly well represented in the table, it shows, with tolerable accuracy, average juice conditions in these Islands, May having the best record.

What, however, your committee wishes to draw especial attention to is that the month of January, when, as a rule, our factories begin to crush, has under normal conditions very little to recommend it from the standpoint of juice purity and consequent sugar returns in comparison with the later months. Especially is this apparent in the juice of canes of heavy growth when the character of non-sugars during this month are taken into consideration.

According to the statistics given, the one diffusion mill does excellent work and has the least loss in manufacture. Extraction given is 97.25 per cent.

EXTRACTION.—With the object of obtaining definite statements concerning this important point in chemical control, your committee asked of the different managers the following question: "What methods do you employ for arriving at the sucrose in the cane and for extraction?" To this a number of replies have been received which are set forth in Appendix attached and which forms part of this report. Upon referring to this it will be found that there are but one or two instances of extraction being based on weight of cane and weight of juice. In the remainder, the calculation starts from the percentages of fibre and of sucrose in the cane.

It is a very difficult matter to obtain satisfactory results in determining extraction. At some Estates cane is transported to the mill in flumes, is not weighed and elaborate calculations ensue. If it were necessary to obtain the extraction on the weight of cane, and that only, the results could probably more nearly approach exactness by the use of accurate weighing machines. When, however, the extraction on the sucrose in the cane is required, the subject becomes complicated, and careful testing and calculation is essential for approximation to actual fact.

Your committee is persuaded that some of the replies given, have been very much condensed and do not, except by brief

outline, represent working methods. This, for instance, is brevity itself:

"(Sucrose in normal juice by 100-fibre in cane) —.1 or .2 or alcohol extraction, which two methods give here same results."

Some of the other methods, however, are complete and show careful thought in the working out, and are of great interest.

As there has been, and is, no definitely accepted formula for extraction work in this country, these replies are submitted just as they have been received, and without comment upon details, to the consideration of the Association.

We, however, think that the following suggestions are not out of place:

(1) That the sampling for determination of the sucrose and fibre in cane, and for sucrose in bagasse, be done in the most careful manner on account of the small quantities taken for analysis from an immense mass of material.

To illustrate this point, let us take for example an extraction of 83 per cent. on the weight of cane. This gives 17 lbs. bagasse for every 100 lbs. of cane. Thus in a mill grinding, let us say, 800 tons of cane per day, we have 272,000 lbs. of bagasse from which we take less than one pound for daily analysis to determine the sucrose content.

(2) That while all determinations for extraction of sucrose in the cane are approximate, we should appropriate that method which approaches the nearest to accuracy, with a view to its adoption here.

(3) That a committee be appointed to take this one subject in hand and report at the next annual meeting upon the most suitable method for such adoption; thus giving a proper practical basis for the sugar concerns of this country to work on.

This last suggestion was decided on because of the short space of time between the date of receipt of methods and the presentation of this report, during which the chairman had no opportunity of consulting with the remainder of the committee. Moreover the subject is important and these methods are deserving of study. On account of these things and because the methods probably represent all the mills where there is chemical control, it is not thought advisable to pass opinion now.

CLARIFICATION.—The ordinary clarifier is still in use in the greater number of Hawaiian sugar houses. Judging, however, from present indications the Deming Superheater is steadily

gaining ground, and has been or is being installed in all of the new large factories.

The "continuous selffiltering" system used in connection with the superheater, is not a success. The almost unanimous decision of those who have been questioned upon, and had practical experience with the subject, is that it is necessary to have the absolute repose offered by separate medium sized settling tanks, for proper precipitation.

Outside of the question of precipitation, one practical drawback to the continuous settling system, with the large sized tanks in use, is that it delays the juice too long in transit from the superheater to the evaporator, and any delay beyond that necessary for proper subsidence does not make nor gain either in fuel or otherwise. As one object in sugar house work is to get the juice from the crushers as rapidly as possible to the concentrators, compatible with efficient clarification, the liming tanks used in connection with the superheater should not be larger than convenience calls for.

These remarks do not reflect on the superheater itself, for it is the most rapid working clarifier we have seen, and with separate settling tanks, as at Ewa, the precipitation is almost perfect.

The use of "Clariphos" or a solution of acid phosphate, has been tried as an aid in the ordinary clarifier, with great success. The gain in purity of low grade juices clarified with this adjunct, has been quite marked. Particularly was this so at Kohala Sugar Co. during the season of 1898 where it formed an important factor. In connection with the Deming Superheater, Clariphos has not been used; but if some plan were devised whereby this agent could aid clarification in the superheater as much as it has aided in the clarifier, it would be of great value.

When you come to think of it, this country uses practically the same methods it used fifteen years ago for this very important part of mill work—clarification.

Carbonatation is practiced in one mill; Clariphos is used to but a limited extent; and the success of the Deming Superheater, apart from its sterilizing qualities, depends in a measure upon its superiority as a clean, convenient, cheaply operated machine.

While immense sums have been expended for improved sugar house machinery, the use of but one general defecating agent, lime, remains. Your committee has no suggestions to offer.

It merely voices the hope of those sugar boilers who have to work with juices of low purity, that science may, in some way, devise a plan for the removal from the juice of more of those "gums" or non-sugars which affect all stages of manufacture from clarifier to sugar room.

FILTER PRESSING.—Very few factories double press their scums; when this is done, a cake very low in sugar can be obtained. At the same time it should be borne in mind that, in double pressing, a large amount of impurity in the cake is carried back into the juice; and that it has not yet been definitely settled, to how low a point the sugar content of the press cake may, with profit, be reduced.

The preference of our planters seems to lie either with dilution of scums before pressing, or with a thorough lixiviation of the cake with water in the press. Either one of these is much more convenient than double pressing; although it appears from the data at hand that the lowest noted average sucrose content of press cake is obtained by double pressing.

A filter press with more than one water inlet has not yet come under our observation. Still it would seem a reasonable conclusion that another inlet on the opposite upper side of the press could not but be of advantage in that it would insure a more thorough and more rapid covering of the press cake to be washed.

In connection with the custom of storing the press cake at some of the mills, the following test was made by Mr. J. T. Crawley on Ewa press cake for determining this loss in storage. This does not apply to the few factories where there may be compost heaps scientifically arranged for the preservation of the ammonia.

Press Cake.	Per Cent. Ammonia.
Fresh	2.64
3rd Day	1.90
10th Day	1.41

Mr. Crawley says, "An average of 14 tons press cake per day, or 7 tons dry material, would give 52.8 lbs. ammonia per ton, which is worth \$7, or \$49 per day. A little less than half this ammonia escapes during the first ten days."

The above demonstrates the advisability of turning over this refuse of manufacture to the field department without the slightest delay.

CRYSTALLIZATION IN MOTION.—This system is installed in but

two factories. From the Oahu Sugar Co., Mr. Ahrens writes of this: "So far I am convinced that, in the course of a very few years, all progressive plantations will have crystallization in motion."

From this system at Oahu Sugar Co., there were produced:

78.49% of No. 1 Sugar	95.92 Polarization
21.51% of No. 2 Sugar	91.72 Polarization

100.00%

The average purity of the waste molasses was 38.9% and there were 323 lbs. of waste molasses per ton of sugar.

It should not be overlooked that the above work was accomplished, during the first season of a new mill, with all its attendant drawbacks from mixed juices of an average purity of less than 83%.

A sugar boiler from Java, who visited the Hawaiian Islands in the early part of this year, stated to a member of this committee that, in Java, the purity of the waste molasses was never more, and often less, than 35% in those factories which used crystallization in motion; but, he added, that it was found necessary to use granulators in connection with it to thoroughly dry their sugars, in order to avoid fermentation in transit. This statement from Java concerning granulators, corroborates what Dr. Maxwell stated some time ago in connection with moist sugars from the crystallization in motion process at Kealia; and it appears to us that, if we are to come to crystallization in motion, we shall have also to come to the use of granulators, as the Javanese have done.

This process is so untried here that we cannot, from figures at hand, pass upon its efficiency. The following advantages are claimed for it:

- (1) It is a quick process; ten days after the crushing was completed at Oahu mill, all of the sugar was out of the mill.
- (2) There is no re-melting.
- (3) There is no labor in transfer from vacuum pan to centrifugals.
- (4) There are no sticky coolers nor fermenting molasses cisterns and their attendant inconveniences.

Against these advantages stands one great objection, viz: the cost of equipment.

We shall therefore look with increase of interest at the results which may be obtained from it, at Oahu Plantation during the forthcoming crop.

FERMENTATION OF SUGAR.—The data which have been received concerning this, would indicate that the loss in polarization in transit this year, is considered to be slight. Owing, however, to the vague nature of some of the replies, your committee cannot regard the matter in the same light. An average loss in polarization of even one-fourth of one per cent. on the whole crop of this country, means considerable money, and the subject is perplexing.

From five plantations comes word that there has been no loss whatever.

One plantation loses one per cent. on No. 1 grade and none on No. 2; another loses 1 per cent. on No. 2 grade and none on No. 1.

Two plantations acknowledge a loss, but do not state how much or in what grade; others, again, refer to a slight loss.

On the whole then this question seems to be giving less alarm than formerly, even if the cause of the fermentation be not accurately located. The preponderance of opinion, however, for its prevention seems to lean towards the working of juices slightly alkaline, cleanliness in the sugar house and one other essential to be mentioned later.

Referring to granulators again, all of the managers addressed have, with one accord, spoken of these machines as valuable accessories for the prevention of loss in those sugars which are sent around the Horn. So that there is entire unanimity of opinion in Hawaii, on one point at least, regarding the prevention of fermentation. Some plantations prefer "slightly alkaline juices," others "neutral juices," and again, others "properly limed juices;" but it is noted that all, without exception, emphasize the necessity of thoroughly drying the sugars.

This is a decision, we think, of vast importance which, if carried out in the proper sense, will make itself felt in our New York returns.

Before turning from this matter, your committee wishes to again urge the necessity of reducing this loss in transit to a minimum, and of supplying the refineries with "raws" that can be easily and economically manipulated. It is not known how long it may be before our sugars will be sold in open market; and with the very probable closer competition of the future it behooves us not to leave a stone unturned which will enable us to manufacture and deliver a product which will not be discriminated against by the buyer for any reason whatsoever.

GENERAL WORK.—All of the factories work over their thirds, some a portion of seconds. This is generally accomplished by re-melting the lower grades; a few however put their thirds back in the pan dry on which to build grain. The plan of re-melting involves the removal of certain of the impurities and seems on general principles to be more advantageous. As the fear that lower grades, when worked over with the juice, might interfere with the keeping qualities of the sugar appears to have been removed; the time probably soon will be, with the tendency of the age, towards large pans and slow boiling, when but one grade will be shipped from the sugar house. Probably even now the reason for not working over the lower class of seconds, if sifted down, will be found to be lack of either sufficient pan capacity, or of enough centrifugals, or of both.

The necessity for rejection of the not only non-productive, but injurious cane top in the field, being apparent, the following system for controlling this has been adopted at the Ewa mill this year. The suggestion is made that it be tried elsewhere, where there is chemical control. It consists merely in the testing by the chemist, twice a week, of an average lot of the uppermost joints of the cane at the mill carrier for determination of their juice purity and sucrose. Recommendations to the field overseers follow, to cut higher or lower according to the tests made.

Through the courtesy of Mr. J. N. S. Williams we have received a statement of sugar house control and of the cost of sugar manufacture in a Cuban mill. This latter statement coming from a competitor country should be of great interest to us.

A comparison, per ton, of Cuban mill with the Ewa mill cost is given herewith:

	1898	1899
	Cuban Mill (8000 tons)	Ewa Mill (22,300 tons)
Unskilled labor	1.47	.99
Skilled labor . . . . .	.76	.38
Bags	1.04	.95
Fuel . . . . .	.02	.10
Lime, Oil, etc. . . . .	.50	.39
	<hr/>	<hr/>
Total, without repairs.	3.79	2.81
Repairs . . . . .	.03	.62
	<hr/>	<hr/>
Total, with repairs.	3.82	3.43

There is, of course, something omitted in the figures for "Repairs in the Cuban Mill," \$240 for machinery repairs on an 8000 ton crop is, from the Hawaiian view, where the cost of a whole year's repairs are included, incredible. Still, with this excluded, it is a good showing on the crop given.

Your committee has found it very difficult to make up a report. So much of the ground has been worked over and worked over so well, that there is very little left. If, however, the papers referring to calculation of extraction should prove to be an entering wedge leading to the establishment of a uniform method for determining this important point, we shall be satisfied.

Respectfully submitted,

GEO. F. RENTON,

Chairman.

:o:
 REPORT ON FERTILIZATION.

(By Mr. A. Lidgate.)

Does commercial fertilizer build up our soils and render them more fertile from year to year, or is it only a stimulant by the use of which we are able in a comparatively short time to force from the soil a great amount of its fertility or stored plant food, thus getting from it at some expense for stimulants a larger yield of sugar for a short period, leaving the soil at the end of this time in an extreme state of poverty, which, by nature's methods, would never have occurred?

In my opinion, true fertility can only be maintained by rational methods of cultivation, such as rotation of crops, bare fallow, green soiling, the liberal use of stable manure and all waste products from the sugar-house and farm.

Burning our fields after harvesting the cane is a great waste of plant food. The reason of its universal practice is the troublesome nature of the work required to get it back into the soil; this can be done for the sum of \$4 per acre, for either plant cane or ratoons. In the former case it often means the loss of the use of a field for one year, but are not our fields entitled to this rest? We have not found that \$40 worth of fertilizer will equal the \$4 spent in the trash burying; when a year's rest can be given the field the result is much more satisfactory. In ratoons a very simple method is employed which gets the trash thoroughly under and at the same time gives the field a partial deep plowing. For dry years this is a great help to the crop as the mass of rotting trash furnishes a bed

of moisture through which cane roots will be found in abundance.

The reasons for not burying trash are its expense and a fancied increase of borer; the first has no weight, as the expense is small and the gain on the immediate crop will repay it many times to say nothing of the gain to the land in fertility and mechanical condition. We have not found that it increases the borer; on fields that the trash has all been put back for eight years the borer is no worse than on fields burned; perhaps it would be well to state that there is very little borer in this district.

Stable manure, night soil and waste products from the mill or sugar-house are so husbanded that at least 200 acres each year gets a liberal dose of these materials. The land so manured invariably grows the best cane not suffering from occasional droughts to the extent of fields treated with commercial fertilizers. Stable manure is treated as follows: Large sheds are built convenient to the stables into which the manure and saturated bedding are wheeled, each morning this is spread evenly and a quantity of potash salt or Dr. Averdams' manure preserver is scattered on the top of it to help in retaining the ammonia, at night a flock of several hundred sheep are folded on this; by their tramping and leavings they compact the heap as well as add to its fertility, thus preventing the burning up of most of the valuable part of the manure, as usually is the case.

For several years this estate has had from 1,200 to 1,500 tons of manure each year, whose value by analysis is \$4 per ton. We think \$6,000 a year worth saving. Night soil systematically gathered will go over a good many acres of poor places each year and help the yield of a doubtful field quite a good deal. Cheap and convenient sanitary arrangements can be made so that the expense of gathering the night soil will be slight and at the same time the camps can be kept perfectly free from the nuisance of seeking vaults.

Green soiling, we have practiced for several years and have derived great benefit from it. The only plant that is used for this purpose is the lupin; this planted in the beginning of winter grows in four months to a height of three to four feet, covering the field with a heavy growth. At first considerable difficulty was experienced in plowing this under because of the size of the plants and the immense amount of foliage; this has been overcome by the use of the "Secretary disc plow," which

cuts them clean and turns them completely under, at the same time doing an excellent job of plowing and harrowing combined. Green-soiling, in my opinion, is perhaps the nearest we can come to copying nature's methods of creating plant food that is at once available. Bare fallow, which is a weak method of green-soiling, for us has very little value as compared with the former; owing to the climatic conditions, the natural grasses do not grow rapidly and there is very little if any root or plant formations returned to the soil; however, it has this in its favor, while the field is in bare fallow it is resting from cane.

These methods are very old ones that have been in use in older countries for centuries; they were adopted for just the reasons that are forcing us in this country to make use of them. While our fields are new and full of fertility we can draw on them from year to year and have our drafts honored, but when they fail, as they surely will, is it not then rather late to begin a more rational method of cultivation?

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HAWAIIAN FORESTRY.

(Communication from President Dole.)

On September 21st last President Dole addressed a letter to Dr. Walter Maxwell in which he stated that the Government had been for a long time desirous of having an expert forestry report on forests and forest interests of the Islands. The President called Dr. Maxwell's attention to the fact that the expectation of having Mr. Fernow from Washington, D. C., come here was disappointed, and he therefore suggested that if Dr. Maxwell, through his relations with the United States Government, or otherwise, could obtain information of a capable man for the purpose, the President would be very glad to have him do so and to make such recommendations in regard to the subject as he (Dr. Maxwell) might deem advisable.

In reply Dr. Maxwell stated that he had referred the matter to the directors of the association and they had decided the time was inopportune for action.

Early in November President Dole laid the matter before the Planters' Association in the following letter:

EXECUTIVE CHAMBER.

HONOLULU, H. I., Nov. 6, 1899.

C. M. COOKE, ESQ., PRESIDENT OF THE HAWAIIAN SUGAR
PLANTERS' ASSOCIATION, HONOLULU.

SIR:—Some time since I addressed a letter to Professor Maxwell, asking him to correspond with the proper authorities for

information in regard to an expert forester to come to the Islands to examine the status of the Hawaiian forests and the forest needs of the country and report. The last Legislature appropriated \$1,500 for the pay of such a man on the guarantee by the Sugar Planters' Association of an equal amount. Professor Maxwell informed me later that the Sugar Planters' Association had, by resolution or otherwise, expressed itself as unfavorable to the immediate prosecution of this enterprise.

I wish to ask the association, through you, if it will not reconsider such action and give the measure the financial support which was announced last year? I feel that this matter is of importance to all agricultural interests of these Islands, but particularly to those related to sugar cultivation, and the present seems a more opportune time than any later time would be for obtaining this information inasmuch as the coming in of Americans desirous of obtaining land and the uncertainty of the nature of future Congressional action in regard to our public lands make it important that we should have, without delay, the fullest obtainable information upon our forests and the needs of the country in regard to re-forestation. Without such information there is danger that forests necessary to beneficial meteorological conditions will be destroyed and that necessary re-forestation will be indefinitely postponed. The opportunity now exists for obtaining this information; if we let it go it will be lost, and no one can tell when another similar opportunity will be open. The delay may be indefinite.

I am, very sincerely yours,

SANFORD B. DOLE.

In answer the President received the following letter from the association the same day:

HONOLULU, H. I., Nov. 6, 1899.

HON. SANFORD B. DOLE, PRESIDENT OF THE REPUBLIC OF HAWAII, Honolulu.

SIR:—I am in receipt of your favor of the 6th inst. in regard to having an expert forester coming to these Islands to investigate the Hawaiian forests and the forest needs of the country, and beg to state that this matter was presented to the trustees of the Sugar Planters' Association, as reported by Dr. Maxwell.

I note that you would like the association to reconsider its

action and request that the association give its financial support towards such expense, as promised last year.

We hold our annual meeting this month, and I shall take pleasure in laying your communication before the members of the association, and, should they see fit to change the vote of the trustees, I personally shall be happy to see such action taken and shall do all in my power to this end. The reforestation of this country, to my mind, is a very important matter, and I trust that your request may be granted, and that the delay may not in any way prejudice the best interests of our Island forests.

Very respectfully,

C. M. COOKE,

President Hawaiian Sugar Planters' Association.

On November 21st the subject was brought before the annual meeting of the Planters' Association, and, after considerable discussion, the matter was approved and referred to the board of trustees to be carried out and the financial support granted.

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DISEASES OF CANE.
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The following report on the Diseases of Cane was received from Prof. Koebele, who is now in Australia, investigating this subject. The report was read by Secretary Bolte.

SYDNEY, N. S. W., OCT. 5, 1899.

TO THE HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

GENTLEMEN:—To my inquiry some months since Dr. Kottmann, has had correspondence with the Fijian sugar plantation managers with reference to the cane borer, *Sphenophorus obscurus*, and as far as known for some years past the borer had not been numerous on those islands; in fact it is said that the beetle has disappeared entirely from the cane fields, yet through what cause or enemy is not known. I shall proceed to the Fiji Islands at once and investigate the subject thoroughly.

Of the interesting observations made on these injurious beetles during the spring of the present year, a full report will be made later on and I give herewith some of the more important facts in a concise form. The beetle is a very long-lived insect. A number of females collected in the field on February 8, 1899, were kept and fed in confinement without males and produced fertile eggs daily and continuously up to June 12,

and were still in a good condition when I left Honolulu for the Coast on that date. From two to six well developed eggs are always found in the ovarium on dissection, according to her age. This number may be put down as a daily product of the female borer, and we can safely say that a female borer will live and produce eggs in quantities for at least six months. This will show us how important it is to destroy the beetles wherever found.

On February 8, 1899, 4,545 beetles were brought to the office at the Lihue plantation; and, as Mr. C. Wolters informed me, these were collected by ten men and ten women, while stripping, on baits of split cane laid out for them at a cost of about \$9.00. Of these beetles 3,181 proved to be males and 1,364 were females. Placing it at a very low estimate, 200 eggs for each female, it will give us 272,800 eggs, or say fully 200,000 larvae which would be able to ruin at least 50,000 stalks of cane.

The food of the matured insect in cane fields is the tender sheaths of leaves; as soon as these separate from the plant, the beetles will go behind and here feed, and lay eggs; yet a favorite and preferred place is the holes in older plants from which beetles have come out. Wherever the female can enter a plant she will remain boring along tunnels of old larvae, and, as has repeatedly been observed, here depositing her eggs often but one-half inch apart and the succeeding larvae will leave little of the plant, save fibres.

Owing to the numerous ants which irritate but do not injure the hard beetles, the bait-trap of split cane is not such a success as it proved at the Fiji Islands; yet large numbers of them can be collected by this plan which should by all means be adhered to. It has been found that the cane pieces left in the field in a few weeks were completely filled with borings of young larvae, which can not mature in the dry cane but invariably perish. For this fact alone the otherwise useless pieces of cane should be laid out.

In confinement the eggs will hatch on the sixth day; the larvae would become full grown in from six to eight weeks; the pupa transformation will take about two weeks, yet the beetle will not come out until some time later.

In nature it will be found that the whole duration from eggs to matured insects will take from two to three months, according to conditions and state of food.

Later advices from Prof. Koebele, state that while in Fiji he was able to verify reports of the existence there of one or more

varieties of cane, thrifty and of high quality in juice and purity; which the destructive borer does not attack. This variety of cane is called the Malabar. Experiments made with this cane prove it to be the only cane in Fiji which the borers do not attack. Prof. Koebele sends one case of Malabar seed cane to be experimented with here and arrangements have been made so that further shipments can be secured from Fiji through the Colonial Sugar Refining Co.

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HAWAII'S LEADING INDUSTRY.

The annual reports read before the Planters' Association last month, and which have appeared in the previous and present issues of this Monthly, will be perused with special interest by sugar men everywhere. They embody the results of careful experiments in the various branches of cane culture and sugar manufacture, to which they refer. No cane planter or sugar manufacturer can afford to neglect any sources of information that throw new light on the constantly improving methods of cultivation and manufacture that are being introduced with more or less success in different countries. Nor should any planter fail to read the reports contained in this Monthly, which may explain some points regarding which he has had doubts, and which may appear to be contradictory propositions. For this reason, everyone interested in the sugar industry whether owner, planter, engineer or sugar boiler, should provide himself with such periodicals as throw the most light on its successful operation.

When the reader compares the primitive methods still practiced in cane culture and sugar making in India and the Philippines with those of Java, Hawaii and other equally progressive countries, the results secured by the application of skilful methods will be apparent at a glance. The beet sugar industry is a strong competitor to that of cane, and can only be successfully met by the application of the latest improvements made in every step of the industry.

There are some details of interest which the reports read before the Planters' Association do not give, which may lend additional interest to this subject, and are to be found only in the reports of managers to the shareholders of sugar corporations. Among them is that of the Ewa plantation on this island, which has just closed the most successful year in its history. Although it is at present the largest, there are others,

following close in its track, which may yet surpass it in the annual yield of sugar, which for the year 1899 was 22,357 short tons.

Regarding the treatment of growing cane, Manager Renton of this plantation says in his report to the shareholders: "It is apparent that any water passing through the soil, beyond and far away from the cane roots, carries with it a certain amount of soluble matter, whether it consists of fertilizers applied or fertilizing elements already stored in the land. Therefore, any water beyond that taken up by the cane is engaged in a leeching process that is detrimental. Thus, in spite of the generous fertilizing at Ewa, some of the older fields show a decrease in available potash and in lime. The above is not mentioned to demonstrate the probability of decreased yields, or that there should be the slightest alarm over land conditions, but in my opinion, it does amply demonstrate that an alteration is in progress which should and can be arrested; and that, in the economical application of irrigation water, we should employ such foresight as prudence dictates, and not keep out of mind these vital soil conditions which are out of sight."

Referring to the system of profit-sharing which has been practiced at Ewa for several years, he says: "This continues to be, as it has been in the past, a decided success with the Chinese and Japanese companies. Under this plan there are at present employed at Ewa thirty-eight profit-sharing companies, aggregating five hundred and eleven men; and all of the fields, except two, are worked in this way. There is no friction to speak of, the men work better, are more contented and the whole scheme forms, among the laborers, a sort of balance wheel of conservative elements whose interests are identical with those of the employer.

"Some of the profit-sharing Americans, who arrived last year, have, for various reasons, returned to the United States. Those who have remained work harmoniously together and with the plantation, and look forward contentedly to the harvesting of their crop during the forthcoming year. A continuation of this same plan, or some modification of it, is contemplated by the management, provided the present arrangement results satisfactorily.

The same system is being introduced on other plantations in various ways, and there is good reason to hope that it will prove to be a solution, partial at least, of the vexed labor question.

This report shows the great care which is taken in recording the various details of the process of manufacture, from the weighing of the cane as it enters the mill, to the final bagging of the sugar as it leaves the factory. It is only by strict attention to the minute details in every step of the process, that the manufacture of sugar can be carried on with profit in such large and expensive factories as that of Ewa, which is, or soon will be, capable of turning out from thirty to forty thousand tons annually of the purest sugar made in any country.

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HAWAII AS A TERRITORY OF THE UNITED STATES.

We are indebted to his Excellency the Minister of Foreign Affairs for a copy of the bill now before Congress, providing a government for the Territory of Hawaii. It is the same that was referred to the Senate Committee in December of last year, and by that committee has been amended; and will be brought up for action as among the unfinished business of the last session, as soon as the Senate orders it.

The bill has 109 sections, and is about the length of the present constitution of Hawaii, on which it is based, adopting many of its provisions with very few changes, though there are some new provisions. It names expressly the present Civil Code and Penal Laws of Hawaii, as compiled by Sidney M. Ballou, issued in two volumes in 1898. The name given is the "Territory of Hawaii."

Section 4 provides that "all persons who were citizens of the Republic of Hawaii on August 4, 1898, are hereby declared to be citizens of the United States.

Another section relates to citizenship and the right to vote, as follows:

"Sec. 18. That no person shall be entitled to vote at any general election in the Territory of Hawaii prior to nineteen hundred and three, who, having been entitled to qualify and vote under the constitution and laws of Hawaii prior to October, eighteen hundred and ninety-seven, and since July, eighteen hundred and ninety-four, failed to register as such voter, unless he shall take an oath to support the Constitution of the United States. But this disqualification shall not apply to any person so entitled to vote at a general election who was prevented from registering as a voter by reason of sickness or necessary absence from the Hawaiian Islands."

Section 7 designates what laws of Hawaii shall be repealed, and what continue in force.

Section 9 abolishes the office of President of Hawaii, and in its place provides for the appointment of a governor.

Section 89 brings us under the internal revenue laws of the United States, and if the war tax is not repealed, this will impose small taxes on many things that we are now free from, and for a time will probably be irksome.

Sections 10 to 86 specify changes in our local laws and government, to conform to the new order of things. Some of the present laws will continue in force, with certain changes that become necessary.

Section 87 provides for the election of a delegate to Congress.

Section 88 provides for a Federal District Court, Judge and Marshal, to be included in the ninth judicial district of the United States.

Sections 91, 92 and 93 are so important that we quote them in full:

Section 91. That until further provision is made by Congress the wharves and landings constructed or controlled by the Republic of Hawaii on any seacoast, bay, roadstead, or harbor shall remain under the control of the government of the Territory of Hawaii, which shall receive and enjoy all revenues derived therefrom, on condition that said property shall be kept in good condition for the use and convenience of commerce, but no tolls or charges shall be made for the use of any such property by the United States, nor by any vessel of war, tug, revenue cutter, or other boat or transport in the service of the United States.

Section 92. That Hawaiian postage stamps, postal cards, and stamped envelopes at the post-offices of the Hawaiian Islands when this Act takes effect shall not be sold, but, together with those that shall thereafter be received at such offices as herein provided, shall be cancelled under the direction of the Postmaster-General of the United States; those previously sold and uncanceled shall, if presented at such offices within six months after this Act takes effect, be received at their face value in exchange for postage stamps, postal cards, and stamped envelopes of the United States of the same aggregate face value and, so far as may be, of such denominations as desired.

Section 93. That the public property ceded and transferred to the United States by the Republic of Hawaii under the joint resolution of annexation, approved July seventh, eighteen hundred and ninety-eight, shall be and remain in the possession,

use, and control of the government of the Territory of Hawaii, and shall be maintained, managed, and cared for by it, at its own expense, until otherwise provided for by Congress, or taken for the uses and purposes of the United States by direction of the President or of the governor of Hawaii.

Section 94. That the following officers shall receive the following annual salaries, to be paid by the United States: The governor, five thousand dollars; the secretary of the Territory, three thousand dollars; the United States marshal, two thousand dollars; the United States district attorney, two thousand dollars. And the governor shall receive annually, in addition to his salary, the sum of five hundred dollars for stationery, postage, and incidentals; also his traveling expenses while absent from the capital on official business, and the sum of two thousand dollars for his private secretary.

The following sections of the bill are important and interesting:

Section 99. That quarantine stations shall be established at such places in the Territory of Hawaii as the Supervising Surgeon-General of the Marine-Hospital Service of the United States shall direct, and the quarantine regulations for said islands relating to the importation of diseases from other countries shall be under the control of the Government of the United States. The quarantine station and grounds at the harbor of Honolulu, together with all the public property belonging to that service, shall be transferred to the Marine-Hospital Service of the United States, and said quarantine grounds shall continue to be so used and employed until the station is changed to other grounds which may be selected by order of the Secretary of the Treasury.

The health laws of the government of Hawaii relating to the harbor of Honolulu and other harbors and inlets from the sea and to the internal control of the health of the islands shall remain in the jurisdiction of the government of the Territory of Hawaii, subject to the quarantine laws and regulations of the United States; and the United States shall sustain one-half of the cost of the maintenance and execution of the health establishment of the government relating to the leper settlement on the island of Molokai, and the leper hospital at Kalihi, and the homes at which the children of lepers are received and cared for on the island of Molokai and at Kalihi.

Section 100. That all vessels carrying Hawaiian registers on the twelfth day of August, eighteen hundred and ninety-eight, shall be entitled to be registered as American vessels,

with the benefits and privileges appertaining thereto.

Section 101. That the portion of the public domain heretofore known as Crown Land is hereby declared to have been, on the twelfth day of August, eighteen hundred and ninety-eight, and prior thereto, the property of the Hawaiian Government, and to be free and clear from any trust of or concerning the same, and from all claim of any nature whatsoever upon the rents, issues, and profits thereof. It shall be subject to alienation and other uses as may be provided by law.

Section 102. That for the purpose of naturalization under the laws of the United States residence in the Hawaiian Islands prior to the taking effect of this Act shall be deemed equivalent to residence in the United States and in the Territory of Hawaii, and the requirement of a previous declaration of intention to become a citizen of the United States and to renounce former allegiance shall not apply to persons who have resided in said islands at least five years prior to the taking effect of this Act; but all other provisions of the laws of the United States relating to naturalization shall, so far as applicable, apply to persons in the said islands.

Section 103. That Chinese in the Hawaiian Islands when this Act takes effect may within one year hereafter obtain certificates of residence as required by "An Act to prohibit the coming of Chinese persons into the United States," approved May fifth, eighteen hundred and ninety-two, as amended by an Act approved November third, eighteen hundred and ninety-three, entitled "An Act to amend an Act entitled 'An Act to prohibit the coming of Chinese persons into the United States,' approved May fifth, eighteen hundred and ninety-two," and until the expiration of said year shall not be deemed to be unlawfully in the United States if found therein without such certificates.

Section 104. That the legislature of the Republic of Hawaii may enact laws not inconsistent with the foregoing provisions prior to the taking effect thereof.

The sections relating to citizenship, in which all foreigners here are interested, are 18, 102 and 103. These show that any American or Europeans can become citizens as readily here as on the mainland. This rule also includes Hawaiians, but not Chinese nor Asiatics. In short, the American laws of naturalization will be extended to Hawaii.