Hawaiian Gazette Supplement, November 5th, 1884.

REPORT OF COMMITTEE ON MACHINERY.

To the President and Members of the Planters' Labor and Supply Co:

Your Committee on Machinery are probable not able to recommend many improvements that are radically new and likely to supercede machinery now in use, and perhaps all the suggestions they have to offer will be only a repetition of those which have been already presented in the PLANTERS' MONTHLY. Still as the months go by, facts accumulate. What seemed at first of doubtful value is proved by continued trial to be an important improvement. What promised large economic results in the beginning is met by counter difficulties that diminish its value.

Mill owners do not at present feel inclined to put in new machinery merely for the looks of it, but the low price of sugar renders doubly necessary the adoption of any improvement which is certain to accomplish a saving of either labor or fuel, or a more efficient extraction of sugar.

At the last annual meeting there was some discussion on the merits of the Jarvis furnace.

Those furnaces have been put in for the following mills: Wailuku, Waihee, Reciprocity, Pioneer, Onomea, Punaa, Pepeekeo, Kapaa, Lihue, Princeville, Kukuiau, and Waimanalo.

Practically the same thing has also been tried at Waihee, and by Mr. Halstead at Waialua.

The verdict of those who have used them is not uniformly in their favor. Mr. Halstead says his furnace burns green trash without difficulty, but with green trash does not produce steam enough. In order to get sufficient steam with his set of boilers he must dry the trash. He thinks, and in order to keep up steam with green trash, the number of furnaces, and of course the boiler capacity must be largely increased.

At the Pioneer Mill, Lahaina, the Jarvis furnace in connection with the Speckels' grate bar gives very satisfactory results. Abundant steam is produced without any larger furnace or boiler capacity than was necessary with dry trash. The trash goes directly to the furnaces from the rolls and no extra fuel is required.

At the Reciprocity Mill, it was found not practicable to get sufficient steam from green trash, and the trash is dried for two days before using.

At Princeville, a test was made of the evaporating capacity of dry trash in the old furnace as compared with that of green trash in the Jarvis. One car load of dry trash evaporated 374 gallons of water in 64 minutes; three-fourths of a car load of green trash in the Jarvis furnace under the same boiler, evaporated 416 gallons in 60 minutes; a gain of 48 per cent. in favor of the Jarvis furnace, to say nothing of the saving in labor required to put the trash in the house and bring it out again. In each case the water evaporated was measured by noting the number of inches on the gauge glass which the water went down, and calculating the number of gallons from the cubic capacity of the boiler between the two points; the feed water being entirely shut off during the test. This result is very marked, and with such a showing it is difficult to see why increased boiler and furnace capacity should be necessary to secure sufficient steam with green fuel.

The chief reason for adopting the Jarvis furnace is the expectation of saving the expense of drying the trash, and if this result is not reached it is disappointing. The truth is no one ought to be satisfied with a single test of this sort. If an engineer succeeds in making his Jarvis furnace do 10 per cent. more work with green trash one day than he has been accustomed to get out of dry, he ought to be able to do the same thing the next day or know the reason why. In several cases the first trial of the Jarvis furnace seems to have been very satisfactory, while the regular work afterwards was less so. It is possible that in order to secure uniformly high duty from it, the flues next the air passages must be kept carefully clean. The test above mentioned should be repeated at intervals of weeks or months, and then it will be seen whether after being in use a considerable time this furnace will do as good work as at first.

One thing seems apparent, the large mills which produce the dryest trash are the most successful in burning it direct from the rolls. So far the Jarvis furnace does not seem to have been in any case more successful in burning green trash than the Spreckels' furnace.

The conditions in these furnaces are uniform feed, open grate bar, and strong draft, with trash as dry as any direct from the rolls, and probably dryer than any of the smaller sized mills can produce regularly. How much of this success is due to the secured pair of rolls with the hydraulic adjustment would be determined by comparing the amount of moisture left in the trash here with that at other mills, and whatever that may be, there is no doubt but that the uniform feed and strong draft are very important conditions. We would reiterate what was said in the Report on Machinery at the last annual meeting in regard to the detrimental effect of letting in cold air as is done inevitably in furnaces fired by hand. A pyrometer inserted in the smoke stack will tell in two seconds when the furnace door is opened and will show a diminution of heat to the extent of 200 or 300 degrees before the charge of fuel has been put in. When the trash is fed automatically into a furnace by rollers only 3 inches apart, no more cold air can get in than is actually needed for combustion, and the result is a uniform heat which must be considerably more efficient than a variable one.

The Landon Smoke Burner has been put in at the Waimea Mill, and will be put in at Kenila. It consists of an arrangement of cast iron pipes through which the air passes and is heated before it is delivered through small openings at the back of the furnace. The efficiency of the plan will be proved when the mills start up.

WASTE HEAT.

It is well known that of the heat actually developed in burning fuel a large proportion is never utilized. Some experiments have been made at Honokaa with reference to utilizing some of the heat that escapes in the smoke stack, and if the results indicated by the trials on a small scale are realized on a large scale, the heat saved will be sufficient so that an extra pair of rolls can be run to take the final 10 or 15 per cent. of juice out of the trash, and the evaporation all accomplished without any fuel but the trash. This is done by means of an ejector which supplies artificial draft for the furnaces, and forces the hot gases through the tubes of a vacuum pan specially constructed with reference to the cleaning of the surfaces where soot and the products of combustion will be deposited. The heat of the gases in the smoke stack will be found in every case to be at least 400° and often would prove to be 800° or even more. When it is remembered that juice under vacuum boils at 160°, it will be seen what a large percentage may be utilized by this method, and it is believed that the steam required for the ejector will be a trifle comparatively.

The process has been patented in this country by Messrs. Rickard and Macelen.

EXTRACTION OF JUICE.

All will admit the advantage of heavy rolls. As mentioned before, one important reason why the Spreckelsville furnaces burn green trash successfully is that the heavy rolls with the hydraulic adjustment do their work at mill. Comparatively few mills would find it profitable to put in the hydraulic apparatus, but it is probable that many of the smaller mills would find it would pay to replace their rolls with others of larger diameter, geared to run so much slower that the power required to run them would be only a little greater. Yet if any change is to be made, the very best results should be sought, and it is doubtless true that no single set of rolls will take out as much juice as two sets combined. Double grinding has been many times discussed, but only at Spreckelsville has the plan been adopted. We may congratulate ourselves that preparations are being made to test the advantage of a second pair of rolls, by putting them in at the Walakea Mill. A spray of hot water will meet the trash as it emerges from the three-roller mill. Thence it is elevated and dropped into a chute which delivers to the extra pair of rolls and from them taken to the trash house. This arrangement permits the three-roller mill to be used alone or in connection with the pair as may be desired. The extra rolls are geared to the same engine that drive the present mill. Repeated experiments have shown that a gain of not less than 15 per cent. of juice is obtained from the trash in this way and the application of hot water is believed to be the important part of the process.

BOILERS.

Within a year past the first of a style of boiler fundamentally different from any in use at the Islands previously, has been erected at the Reciprocity Mill on Maui. It is a Babcock & Wilcox Water Tube Boiler of 125 horse-power capacity.

A general description of the boiler appeared in the October number of the PLANTERS' MONTHLY, and need not be repeated here. The first objection to that style of boiler, which presents itself to one accustomed to trash fires is the apparent shortness of the space for the passage of the gases from the furnace to the smoke stack, suggesting the probability that a large proportion of heat would escape in the smoke stack. Actual trial shows that this is the very point where this boiler has the advantage over others.

The passage of the gases across the tubes instead of lengthwise with them insures contact at every point, so that the heat in the smoke stack never went above 600°, while in the case of two other boilers set alongside of it, the heat went far above that point. A good pyrometer was used so that a careful comparison was made.

The grate surface is large under this boiler and the draft excellent. The only objection to be noticed is, that as the boilers are sent out, the furnace are adapted for coal and not properly for trash. They can easily be set however with a trash furnace which would take away the objection.

DIFFUSION.

It is admitted on all sides that diffusion is the method by which the saccharine matter may be most thoroughly extracted from the cane, and it is to be hoped that the planters will find it worth while to combine in an experiment which will settle the practical questions of the method without involving a heavy outlay on the part of any individual.

The experiments made by the Department of Agriculture in the United States, with diffusion applied to sorghum, indicated that the machinery required for a moderately sized plant to test diffusion on a working scale need not be very expensive. The machine employed to slice the cane consisted of a conical cast iron disk with knives set in slots as a plane iron is set in a carpenter's plane, so that the canes were fed against this revolving disk, and slices were taken off from $\frac{1}{32}$ to $\frac{1}{8}$ of an inch in thickness. The cane met the disk, not at right angles but obliquely, so the slicing was diagonally across the cane stalk. It was estimated that the power required to slice the cane in this manner was less than would be required to crush in the ordinary manner.

In the pamphlet published by Mr. H. W. Wiley, the chemist in charge of these experiments, the diffusion battery and methods of operation are carefully described and the results fully recorded.

The most serious question in connection with the diffusion process seems to be one of fuel. It is probable that the bagasse from a diffusion battery will be worth much less as fuel than trash from a crushing mill, and the question whether the extra gain in sugar will pay for sufficient fuel to supply this deficiency, as well as to evaporate the additional water, seems to be one that can be decided only by trial.

Believing that sufficient time has been occupied by this report, your Committee respectfully submit it.

W. E. BOWEN,
H. F. GLADE,
W. H. RICKARD.

REPORT OF COMMITTEE ON TRANSPORTATION.

HONOLULU, Oct. 22d, 1884.

To the President of the Planters' Labor and Supply Company:

SIR:—Your Committee to whom was confided on yesterday the duty of making a Report on Cane Transportation, beg you to accept the following.

From all we can gather upon this important subject at this late date for enquiry is, a little progress has been made the past twelve months. Some changes for the better, and some combination of two or more different ways of transportation have been made with some degree of advancement.

Oxen in some cases have been exchanged for mules, and others contemplate changing.

Gravitation tramways are growing in favor in hilly regions, and are worked quite successfully in combination with carts, sleds, and horizontal tramways.

Carts and sleds are also used to transport cane to water flumes, from points on plantations not convenient to be reached by a flume. Where water can be had and grades suitable, fluming is preferred to all other modes of transportation.

The rail road, where the country is comparatively level, yet continues in most favor for transporting cane long distances. The intelligence and experience of plantation owners and managers, have enabled them to adopt thus far that particular mode of transportation best suited to their locality.

Where conditions are suitable and distances not too great, carts and wagons are the cheapest for transporting cane, the flume follows next in cheapness.

There is some new idea sprung up in the use of wagons and horses which may become of some advantage in localities where they can be used. It has been adopted by Kukuiau Plantation with fair prospects of success. It consists of strong light iron wagons, with low wheels (about four feet in diameter) with 4 and 6-inch tires, no bed, but a rack 20 feet long, with stakes 4 feet long, and placed 4 feet apart, this rack is placed upon the wheels with a seat and a suitable brake; 3 or 4 tons of cane can be placed crossways upon it, and drawn by four horses down alongside of the cane carrier. Then it is proposed to unload direct upon the cane carrier, and while being unloaded the team is hitched to an empty wagon standing near, and goes for another load. Hills of much grade, and bad roads should be avoided.

As an auxiliary, where there is a constant descent from the cane field to the mill, a sled 12 feet long and 3½ feet wide, made of 4x6 timbers, and stakes three feet long, can be profitably used, by attaching it to the hind axle of the wagon, and 1,000 or 2,000 pounds of cane can be placed upon it, and taken down at the same time with the same team. The wagon pulling the sled, and the sled acting as a brake upon the wagon. Thus arranged, they are a mutual help to each other going down with the load, and that much more cane can be landed at the mill, than if the wagon alone were used. In taking the rig back the team has more labor. But as the forward end of the sled is fastened up under the hind axle clear of the ground, that end of the sled rode down on the wagon with its load dragging the hind end upon the ground, the load being now off, the hind end is also raised and hooked up to the after part of the rack.

Thus the sled is taken back on the wagon. When again in the field the after part of the sled is let down on the ground, when it is again ready for loading. This rig, and thirty-five animals, and about as many men, is expected to deliver alongside of the cane carrier from 150 to 160 tons of cane daily. Where the lay of the land is favorable and the average distance not more than one-half or three-fourths of a mile, gravitation doing most of the heavy hauling and the cane having to be less handled than in any other way recommends it for serious consideration where it can be used. Respectfully,

JOHN M. HORNER,
JONA AUSTIN.

MR. J. M. HORNER, *Chairman of Committee on Cane Transportation:*

As one of your Committee, I beg leave to submit the following, to be embodied in the report on the subject.

There are various means employed to transport cane to the mills, on the Islands, viz.: Steam tramways, wire ropeways, stationary flumes, portable flumes, mule carts, ox carts, &c.

Some plantations have but one of these methods, while others combine several. To make a report giving the comparative cost of each with their workings, and our deductions as to the most satisfactory methods and best results, would be a work of time, so that I shall only attempt to give a short description of the different methods on the Paia Plantation, giving the approximate cost per ton by each.

We use mainly but two systems, fluming, and hauling with ox teams. We flume the cane from the upper lands, using the water for irrigating the lands below the mill.

We have five flumes about three miles each in length, and one mile apart. We cart the cane from the field to the nearest flume, where we have a gang of men stationed who cut the cane into short lengths and put it into the flume, through which it is carried and delivered on to the cane carrier.

In estimating the cost of transportation, we assume that the grinding season is 200 days, and that we flume cane 125 days, and cart direct to the mill 75 days. The cost of transporting cane by flume is about $6.10 per ton of sugar, and is made up as follows:

Estimated cost of 15 miles of flume, @ $833 per mile, flume to last 5 years	$12,500 00
For Interest 10 per cent., and wear and tear 20 per cent. per annum	3,750 00
Loss of water sufficient to raise an amount of cane worth	1,600 00
25 carts @ $125 each, interest wear and tear on same, 20 per cent	624 00
3 yoke of oxen per cart @ $75 per yoke, interest wear and tear 20 per cent	1,125 00
Total for transporting cane for about 2,000 tons of sugar	7,099 00
Or about $3.50 per ton of sugar.	
Then we have for labor per day, 25 bullock drivers, 12 men at flume, 3 men to watch flume, 3 men at cane carrier, and 2 men at rolls, total, 45 men @ $1	45 00
Assuming that we make 17 tons of sugar per day, the cost per ton for labor is about	2 60
Or a total of $6.10 per ton of sugar.	

The cost from the lower field is less, being as follows from fields average distance from mill ½ of a mile:

25 carts @ $125 each, 20 per cent. wear, tear and interest	$ 875 00
3 pair of oxen per cart @ $75 per yoke, interest, &c., 20 per cent	1,575 00
Or per ton of sugar calculating 17 tons per day	1 88
Then for labor 35 teamsters per day, 11 men at cane carrier, and 2 men at rolls, total, 48 men @ $1	48 00
For 17 tons of sugar, $2.82 per ton, or a total cost for transportation by this method of $4.70 per ton of sugar.	

Owing to the necessity of feeding mules grain and the cost of getting cane tops for them, often from fields far distant from the mill, and other reasons too long to be mentioned here, the cost is greater where mules are used.

But in considering the means for transportation of cane, the nature of the land and surrounding circumstances must be taken into consideration. As for instance, at Waianae, where they have a comparatively level country with little available food for working cattle, the tramway is no doubt the best. Although not as cheap as some other methods, for although they have systematized the work there as well perhaps as anywhere else on the Islands, the manager states the cost to be about $7.00 per ton of sugar.

Flumes are probably best for Hilo where water is worthless for irrigation, and there is not nourishment enough in the grass for working cattle.

And so perhaps from the nature of the country mules may be the best for Honokaa.

While at Paia, the combined system of flumes and ox carts, using the water from the flumes for the lower lands, seem to me to be the best for us. Respectfully,

E. M. WALSH.

Honolulu, Oct. 22, 1884.

REPORT OF COMMITTEE ON VARIETIES OF CANE.

To the President of the Planters Labor and Supply Company:

SIR,—The fact that the members of the various Committees have rarely any opportunity of meeting each other, except during the annual session, renders the preparation of reports by the Committees collectively almost an impossibility. And there is an additional difficulty in the way of the Committee on the varieties of cane in that no two of them are resident on the same island, and the Chairman, who is chiefly responsible for the report, is probably less familiar with his subject than almost any gentlemen who listens to him.

It is clear from the various replies I have received, that the bulk of our planters are satisfied with the one valuable cane upon which they depend for their crop. Some state that they are so far satisfied that they do not desire any other on their land than the Lahaina cane. This cane has undoubtedly been, and is, a great boon to us, and we cannot but admire the loyalty of those who speak well of the bridge that carries them over the stream. But there are other proverbs just as valuable, and one is: "Never put all your eggs in one basket." Mr. Home, the Curator of the Botanical Gardens at Mauritius, warned me repeatedly when he was here some years ago, not to rely absolutely on any single cane, but to be prepared with substitutes in the event of some sudden disease attacking our chief variety. Again he wrote me, "I trust it may be a long time before "you have to replace your Lahaina cane, but there is no knowing, and it "is well to be prepared."

I therefore believe that every planter should prepare himself for an emergency, by having a few acres of some other well selected variety planted every year to serve for seed in the event of failure of the Lahaina cane, from the sudden development of some new borer or blight. It was this conviction that led me to procure from Mr. Home at Mauritius, the seventeen varieties of cane which have been so well cared for by Mr. Jaeger, and from which distribution has been made to many plantations. I received two Wardian cases from Mr. Home containing 25 or 26 different canes, but only 17 lived, named as follows: one saunel, three brehhet, five horne, six black cane, seven cane morte, eight vulu vulu, ten miligete, eleven vituatuata, twelve nannui, fourteen vico, fifteen vagabonde, seventeen samea, eighteen seote, nineteen lomaloma, twenty-two kamba kamba vati, twenty-three green and red striped cane, twenty-four large green cane. Amongst the canes which did not survive was twenty-five belcenet, a rose colored cane which, I understood from Mr. Home, was equal to our Lahaina cane, and the mainstay of the Mauritius planter. This beleguet is the cane I was most anxious to get, and I was much disappointed at its failure. I agree with Mr. Jaeger that further efforts should be made to procure this cane, and I hope this company will authorize the small outlay.

The first cuttings of these Mauritius canes were distributed during the first half of the present year, and it is too soon to speak of their relative value. Some of them are doing remarkably well at Laupahoehoe, at Honokaa, at Mr. Notley's, and at several other places. At Hilea, Mr. Spencer states that the white varieties planted in January at an elevation of 325 feet now strip six feet, and that there is no cane on the plantation that now promises as well as the striped varieties planted 1750 feet high, and which stood as well as Lahaina cane. In rainy districts the Mauritius canes appear to grow too thick and may do better in drier places.

The original plants can be seen now at the Agricultural Gardens in King street, opposite the residence of Captain Luce.

Queensland has supplied us with some new varieties of cane imported first to Mr. Turton which have been tried on several plantations. Amongst them are one yellow Caledonia, two big ribbon, three rose bamboo, four Otitnatie and five elephant. The result of these canes at Ookala has not been satisfactory, as stated by Mr. Soper, after three years' trial. They were introduced at Hilea in July last and appear to be growing finely. Of the result there it is too soon to speak.

At Laupahoehoe they have not done well and seem to develop a new kind of borer which has discouraged their cultivation. Mr. Rickard states that at Honokaa, at an elevation of 500 feet the vulu vulu, miligete, nannui, and loma loma seem to do very well and look healthy and vigorous, but the kamba-kamba and some other varieties are very poor.

Of the indigenous and acclimatied canes there are at Hilea nineteen varieties, including the Lahaina, which was brought here first from the Marquesas and planted in Mr. Oodinot's garden at Lahaina. In the year 1865, I remember Mr. Hackfeld informing me that 1½ tons was an average and two tons a good yield per acre for sugar cane, and the comparison of the old with the new canes at Lahaina may have had something to do with the incredulity with which some of Mr. Oodinot's anecdotes were occasionally received. Mr. Spenser states that at Hilea, during the present year, he has taken 6½ tons per acre from second ratoons of Lahaina cane. He also says that under favorable conditions the "China" yields as well as the Lahaina.

Mr. Unna states that in 1861 and 1862 he purchased all the varieties of cane he could get on Maui and planted each variety by itself. He found that the borer would penetrate all other canes before it would touch the Lahaina, and that the latter having fewer and narrower leaves than the old native canes, the sun can more readily get access to the sticks, at the same time ripening the cane and hardening it against the assults of its enemies. Mr. Unna draws attention to the importance of frequent transplanting of cane from a high to a lower level and vice versa, and from island to island, and also from dry laid to irrigated. He states that the natives pursue this course with their kalo and so keep up the quality from age to age. There are nine varieties of ribbon cane grown at Hilea, and Mr. Spencer states that they all grow well to an altitude of 2000 feet.

Mr. H. M. Whitney has in covered a cane which he calls "red Lahaina," and which may be seen growing at his residence at Kawaiu in this city. Mr. Whitney considers this to be a valuable addition to a list of canes, especially for higher altitudes, and I greatly regret that from a slight accident Mr. Whitney has been unable to give a written description of this variety for incorporation in this report. I can only strongly recommend any members who are interested in the subject to confer with Mr. Whitney who will, I am sure, gladly give information regarding it.

With reference to the character of our indigenous canes, I was interested greatly in a statement found in a very rare work published in London in 1882, the diary of Dr. Ellis, surgeon on board the ships *Resolute* and *Discovery*, at the date of their first visit to these islands. Dr. Ellis describes the district of "Anaeoa" as appearing to be covered with gardens and plantations of kalo, &c., bordered with sugar-cane, and he repeatedly describes the sugar-cane as more juicy than any found at other groups or places they had visited. There seems to be therefore historical as well as practical ground for the belief that the soil of these Islands is peculiarly adapted to the cultivation of cane. Furthermore we may be satisfied that we are in possession of a cane that is worthy of our fine soil. By careful treatment of our canes and keeping in view the importance of transferring from district to district as recommended by Mr. Unna and as largely practiced by many planters, we may well hope to maintain our position as regards yield and quality of sugar. This advantage will be in no way impaired if we add the precaution of supplying ourselves with a reserve of seed-cane in case of such a catastrophe overtaking us as has twice overtaken Mauritius in the total failure of their single variety of cane, and the necessity for sending abroad for new seed. Let me close this brief report with another proverb:

For want of a nail the shoe was lost,
For want of a shoe the horse was lost,
For want of a horse the man was lost.

THEO. H. DAVIES,
Chairman of Committee.