THE

PLANTERS' MONTHLY

PUBLISHED FOR THE

PLANTERS' LABOR AND SUPPLY COMPANY

OF THE HAWAIIAN ISLANDS.

Vol. XII.] HONOLULU, OCTOBER, 1893. [No. 10

Planters and others desirous of having analyses made of soils, fertilizers, and the products of the sugar house, are referred to the card of Prof. Shorey, which will be found facing this page.

The price of sugar in New York has fluctuated for the past month between 3.55 and 4 cents, closing at the former price. In several of the principal cities of the United States sugar has been a scarcity, and dealers have been compelled to serve their customers with "half rations" on this account.

Owing to the absence of so many planters, it has been decided to postpone the annual meeting of the Planters' Labor and Supply Company till Monday, December 4, at 10 o'clock A.M. It is to be hoped that all interested in cane and sugar as well as other industrial pursuits will make an effort to be present.

It is stated in Australian exchanges that the Mauritius sugar crop of 1893 shows a falling off of about one-half from that of 1892, the decrease being attributed to the severe hurricane which swept over the island a year ago, and which was one of the most destructive known in the history of that island.

The Japanese colony now in these islands has been largely increased by the arrival, Oct. 24, of 1642 men and women in the S. S. Miike Maru. Added to the number reported in the country August 31, the total Japanese population is now 22,542. As most of these are males, there are probably now here twice as many adult Japanese males as there are of Hawaiians.

The ravages of the cane borer, while they have not been serious in our group for some years past, appear to be on the increase in the West India Islands, with consequent reduction in the sugar crop. The surest remedy is thorough and frequent cultivation of the soil and burning off the field immediately after the cane is cut, before the pest has a chance of changing its habitat. The importance of this last practice cannot be overestimated.

We are indebted to the customs officials for the following statistics. The amount of sugar exported from these islands during the quarter ended September 30, 1893 was 30,772,374 pounds, valued at $1,473,227.19. This includes all shipments from the four ports of this group. The above, added to the exports for the first six months, gives a total of 268,747,485 for nine months of 1893. The exports for the remaining quarter will bring the total to about 290,000,000 pounds for the year 1893 say 145,000 short tons.

Some of our foreign subscribers inquire why the PLANTERS' MONTHLY does not give the monthly exports of sugar and molasses, so that statisticians abroad may ascertain with some accuracy the actual exportations and quantities afloat. Any unofficial record that we might undertake to furnish of the monthly exports of these products could not be satisfactory, while the quarterly reports published by the custom's department are full and accurate exhibits, and these appear in our monthly, and ought to suffice in furnishing the details called for by statisticians.

Two hurricanes have swept along the southern seaboard of the United States during September and October, attended with great loss of life, and it was feared with great destruction of property. The latest reports happily state that the loss to the growing crops—sugar, rice and cotton—will be comparatively small, rice receiving the most injury. Some of the Louisiana sugar planters say that the storm was really beneficial to the growing canes inasmuch as it was suffering from drought, and the rain was very opportune. "Its an ill wind that blows nobody good."

We understand, says the *Manchester Sugar Cane*, that Mr. J. N. S. Williams, who is well known in connection with diffusion work in the Hawaiian Islands, and Mr. James Gourlay, both of the firm of D. Stewart & Co., Limited, are now on their way to St. Lucia to commence operations. Messrs. Stewart have our heartiest good wishes in the enterprise; success in this means a very great deal to the British West Indies, and will go very far to rehabilitate the drooping energies of many of our West Indian planters. By success, we, of course, mean that the returns in sugar will be largely in excess of anything obtained by the milling system, and at little or no greater cost for labor or coals.

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ADJOURNED ANNUAL MEETING.

Agreeably with notice given in the local papers and by circulars sent to each member, the annual meeting of the Planters' Labor and Supply Company opened on Monday, October 30, in the hall of the Chamber of Commerce in this city.

In the absence of the president, Mr. J. O. Carter was called to the chair. The Secretary, Hon. W. O. Smith called the roll, but few members responding to their names.

The president of the Society, W. G. Irwin, having arrived, suggested that, owing to the absence of so many, some of them out of the country, it would be best to adjourn the meeting, as several important questions would be brought before them which ought to receive full consideration.

On motion of Mr. J. O. Carter, seconded by Mr. F. A. Schaefer, the annual meeting was adjourned till Monday, December 4, at 10 A. M.

A CHEAP SPRAYER.

Some of our readers find trouble in obtaining a good and inexpensive sprayer, particularly for grape vines and fruit trees. In the *Florida Agriculturist* we find the following method resorted to by a correspondent, and it looks as though it might be useful in spraying coffee and orange trees, as well as grape vines.

"Regarding spraying pumps, I am best satisfied with one of my own devising. I took the wheels and axle of an old mowing machine, rigged a frame work upon it to support a cask, lying horizontally, attached heavy shafts, and thus quickly and cheaply had a cart just suited to the purpose. Upon the cask I placed a Douglass force pump, arranged with two lengths of hose, and two nozzles. The man who drives the horse walks behind the cart and works the handle of the pump; two men or boys, one on either side, manage the hose, and put the spray just where it is wanted. The horse walks slowly, and the work is hard for neither man nor beast. I spray both sides of the row, use about 300 gallons, and take about two days in going over 6,000 grape vines. I spray six times, at intervals of ten or fifteen days. Out of thirty-six tons of grapes last season, I did not lose five pounds by rot. But I shall spray, rot or no rot. Spraying adds greatly to the health of the vines, and consequently to the size and beauty of the fruit."

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CALUMET FIELD EXPERIMENTS.

One of the most interesting and valuable reports on the analysis of sugar cane, showing the value of different varieties, is that commenced on page 410 of the September issue of this monthly and concluded in this number. We received the pamphlet direct from Prof. Edson, and observing its exhaustive nature, decided to copy it entire for the benefit of our island readers. It embraces several of our best canes, including the Lahaina, Kouala, Ainakea, Honuaula, Ohia, Kokea and Bamboo, if this be the "Rose Bamboo."

The various experiments which have been made by Prof. Edson with the canes which he selected must have some results favorable to an increase of sugar. They seem to sustain Mr. Andrew Moore's argument of checking deterioration of the crop by improvement of the seed, which he proposed to carry out by planting fields expressly for seed.

The result of Prof. Edson's three years' tests with selected seed cane is, that a gain of over seven pounds of sugar per ton of cane can be had each year, amounting on a large crop to several thousand dollars of profit, arising from the fact that the juice is much purer, and consequently richer in sugar.

It will be well for planters to study Prof. Edson's report, and adopt such suggestions made by him as tend to assist in improving the yield of cane. This is the one great point which should be constantly aimed at—the largest outcome from a given area of land. Our fields are doing well, but skill may lead to still better results.

:o:

SUGAR PROSPECTS.

The sugar world enters the new campaign with comparatively small stocks in hand and a bare sufficiency of supplies in sight for the present month's requirements.

After this month, however, there promises to be available for the 12 months a beet crop of about the same size as last year and cane crops which may exceed last year's by possibly 300,000 tons. On the other hand from unusual causes the consumption of sugar this year has been kept at the lowest limit (being in the United States scarcely larger than last year) so that the coming year should require the natural increase of two years in consumption or say 10 per cent. increase (200,000 tons) for the United States alone, unless the result is interfered with by a Government tax on the consumer, through a sugar duty which is now threatened.

The domestic sugar crops of the United States, which are always our principal reliance for consumption at the beginning of the sugar year before other crops are freely available, is very promising to the present time, but unfortunately just at its maturity a violent hurricane has visited the South and inflicted more or less damage on the sugar fields, which, however, it is hoped will not prove serious.—*Willett & Gray's Circular, October 5.*

WHITE'S FIBRE MACHINE.

The public here have been waiting somewhat impatiently for months past to witness the working of the ramie cleaner, which the inventor has for several years been perfecting, and with which he hopes to furnish a machine capable of cleaning not only ramie but every kind of fibre now required to meet the demands of industry. In the Florida *Agriculturist* of October 4 we find the following letter addressed to that paper, which furnishes evidence that the machine may yet be completed and available for the purpose for which it is designed. We wish the inventor every success, and sincerely trust he will be able soon to fully demonstrate that patience and perseverence have overcome all obstacles:

HONOLULU, H. I.,
Sept. 10, 1893.

Mr. James Torbert of this city (Honolulu) showed me an article on pineapple fibre in your valuable paper, the *Florida Agriculturist*, of August 16th. I was very much pleased to read it, as I have been experimenting on all kinds of fibrous plants including pineapple fibre. There are a great many pines grown on the Hawaiian Islands; every year they are increasing in number. The planters all at once realized the fact that they could not get quit of their leaves fast enough only by burning them up. I made the suggestion to some of them to bring me some leaves and I would extract the fibre which would help to pay for the cultivation of the crop, the skins and fleshy part of the leaves could be returned to the land as manure, and the fruit would nearly be a clear profit. Three of the planters namely, Mr. Kidwell. Mr. Torbert, and Mr. Jordan sent me in leaves from their plantations, namely from the smooth leaved Cayenne, the Hawaiian or native pine, and another variety I forget the name of at present. I passed them through my machine, and I was surprised to see what a beautiful fibre could be produced from the leaves. I went further than the mere decortication. I passed it through a chemical process of deguming and bleaching and the product was like silk. I am sorry I have none of the degumed and bleached fibre at present to send to you but will by next mail. I have sent you a small sample of the decorticated fibre right from the machine, and also a small sample put through the washing and stretching process. I am sorry that the samples are so small. It costs so much to send through the mail here. Will send some more so that you can see what the machine can do.

The machines are made in various sizes from 500 pounds to 3000 pounds of fibre per ten hours. I mean by these figures that the machines will produce that quantity of dressed fibre ready for the market (not leaves) in that time. I have also machines for ramie, sissal, banana and other fibrous plants. Should any of your people feel inclined to make any further inquiries with regard to the matter I will be most happy to correspond with them on the subject. * * * *

Some of my machinery for ramie and sissal will be sent on to Figi to fill an order in two or three months.

JOHN C. WHITE.

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OIL FOR MACHINERY—IS ITS USE NECESSARY?

EDITOR PLANTERS' MONTHLY: One of the questions in which engineers differ in opinion is in regard to the use of oil in steam cylinders. There are some men that claim that an engine well do as well, run as easily, and keep in as good condition without oil as with it; but the majority believe in using oil. And since we assume it to be necessary the question arises what is the minimum quantity that may be safely used. My own experience leads me to believe that though oil is necessary, a very small quantity will answer the purpose, if judiciously used. It is generally acknowledged that the less the number of tallow cups for a given number of cylinders, the less will be the waste, and there is no question but that this theory is correct, as the following figures will, I think, fully prove.

At the Kukaiau Mill there is but one tallow cup for all the steam cylinders of the boiling of house, and it works admirably, and the saving in oil was very great from the start.

Last season I was particular in measuring the amount used in all the different departments, and found at the end of the crop that only nine and one-half gallons of oil were used in the boiling house steam cylinder during the entire season. And when I state that none of the pumps stopped for a moment, and that the steam cylinders are in good condition, it must be inferred that this amount was quite sufficient. The amount of cylinder oil used in the two main engines for the entire season was thirteen and a half gallons.

This may not be the minimum amount necessary for the perfect lubricating of these parts, but it is about as low as it is possible to bring it with the present make of tallow cup.

In regard to the lubricating of the revolving part of the machinery, some engineers prefer compounds to oils, whenever it is practicable to use them, but the majority prefer oil. The oils generally used are the castor, lard and sperm all of them rather expensive.

I find that the El Dorado mineral oil, which is at present the cheapest oil in the market, will do equally well for most purposes, if not for all, and will at the same time go further then more expensive oils. At least this has been my experience.

The following is a statement of the amount and cost of the various oils used in this mill in 1893:

40 galls. Lard oil at 65c	$26 00
20 " El Dorado 40c	8 00
23 " Calvoline Cylinder Oil at $1.00	23 00
13 " Castor oil at $1.25	16 25
100 lbs. Tallow at 4½c. per lbs	4 50
Total	$77 75

The small quantity of El Dorado used is due to the fact that we did not commence using it until some time after we had started to grinding. It is also only fair to remark that the crop was not a large one.

I remain yours truly,

GEO. OSBORNE.

Kukaiau, Hamakua, Hawaii, September, 1893.

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GLUCOSE IN SUGAR, SYRUP AND MOLASSES.—The refinements in sugar making have reached such a point that the great bulk of the profit lies in the proper chemical control of the various chemical processes through which the juice passes. One of the most important of these is the determination of the amount of inversion which takes place and the restriction of this to as small a percentage as possible. It is, therefore, of vital importance that the test showing the amount of glucose formed should be as rapid and as accurate as possible. It is with this object in view that Mr. L. A. Sherck, A. B., a chemist in the employ of the American Sugar Refining Company, New Orleans, has compiled extensive tables for the determination of the glucose in sugar, syrup and molasses, and they will, no doubt, prove of valuable assistance to sugar chemists.

CORRESPONDENCE AND SELECTIONS.

FIELD EXPERIMENTS WITH SUGAR CANE ON CALUMET PLANTATION, PATTERSON, LOUISIANNA.—Concluded.

BY HUBERT EDSON, CHEMIST.

SEED SELECTION.

During the autumn of 1890, after grinding was well under way, a series of single stalk analyses were made in the laboratory for the purpose of testing whether sugar canes would transmit to their offspring the relative higher or lower sucrose content which they themselves possess. By repeated experiments a transverse section of the cane was found that represented very accurately the quality of the whole cane, this part was cut out, analysis made of its juice, and the remainder of the cane saved for seed. This section was the third one from the bottom when the canes were cut into four pieces of equal length. Below is given a table of analyses made to test the matter :

LONGITUDINAL HALVES OF SAMPLES.			THIRD QUARTER FROM BOTTOM OF OPPOSITE HALVES OF SAMPLES.		
Solids.	Sucrose.	Purity.	Solids.	Sucrose.	Purity.
14.7	11.9	80.9	15.4	12.8	83.6
15.1	12.3	81.4	15.2	12.3	80.9
16.1	13.8	85.7	16.1	13.9	85.3
16.1	13.6	83.9	16.5	13.8	83.6
17.1	15.4	90.1	17.1	15.3	89.4
18.3	16.5	90.2	18.2	16.4	90.1
16.4	13.3	81.1	16.4	13.7	83.5
16.1	13.3	82.6	16.1	13.5	83.8
16.2	13.8	85.2	16.4	14.0	85.4

I have since thought that for different years the section which represented the quality of the cane might be different, but as it has been found out since that a selection of this kind is not necessary, I have made no further experiments. Selections were first made with the Brix spindle, by which means all canes containing a medium amount of solids in the juice were discarded, leaving only the extremes of the rich and poor canes. The juice from these latter was taken into the laboratory for further analysis, and all canes of low percentage of solids in the juice and having a purity under eighty-five, were planted as representing the poorest canes to be found. In like manner the richest canes were selected from those containing a high percentage of solids and having a purity over eighty-five.

Both extremes were taken in preference to one, because it was thought that if anything was to be gained by this line of experimentation it would be shown much quicker by watching the progeny of vital opposites instead of comparing only one extreme with an average which, to say the least, would be very difficult to obtain. In fact, selecting the extremes was the only way a comparison could be made. If only the richest canes had been selected there would have been no standard by which to judge whether anything had been accomplished. With the extremes if there is a difference in their offspring, there must also of necessity be a difference between each of their offspring and the mean. We have, then, if we find that the richest canes which can be selected produce a cane richer than that from the poorest canes selected, proven that this resulting cane is also richer than the average of the lot of cane from which the selections were made would have produced had the canes of medium sucrose content not been thrown out. This, I believe, will be considered a sound conclusion by agronomists and plant physiologists.

It would be well, perhaps, before giving the results of this work at Calumet to call attention to the generally accepted skepticism as to the success of experiments which strive to improve the quality of sugar cane by systematic and continued propagation from its best individual stalks. This skepticism means that there is a disbelief in the application of evolution, or "natural selection," as Darwin terms it, to plants reproduced from the bud, though its principles are known and used continually with seed-bearing ones. I do not know that any experiments such as this at Calumet have, up to the present time, ever even been tried with sugar cane. It seems to be an entirely new and untried ground in experimentation, though the advisability of such work being tried has often been discussed, but never in a sufficiently intelligent manner to induce an actual trial of its usefulness.

Wondering if this skepticism among cane agriculturists had any foundation in fact or not I consulted several scientists familiar with different matters involved in the experimentation as to what their belief as to the probable outcome of the work would be, and I give below some of the opinions secured.

Dr. Maxwell, of the United States Department of Agriculture, a life-long specialist in physiological chemistry, personally expressed his belief to me that success would come to such an experiment as the one started here. Mr. A. A. Denton, director in charge of the Sorghum Experiment Station of the Agricultural Department, whose work with sorghum has been on the same lines as are to be followed here with sugar cane, and who, perhaps, is the best informed man in the United States on such subjects, also assured me that he saw no reason why a great deal could not be done for sugar cane by the systematic propagation of high-grade individuals. In reply to a request on Dr. Wasey, Botanist of the Agricultural Department, for his opinion as to the advisability of such experiments, I received the following reply :

Mr. Hubert Edson, Calumet Plantation, Patterson, La.:

DEAR SIR:—Your letter of recent date to the Botanist of the Department stating some of your experiments in the growth of sugar cane has been duly received, and in reply he states that he expects that sugar cane would be subject to the same conditions with respect to its propagation from buds, as exists with reference to other plants, that is, selection of special kinds on account of excellence of saccharine qualities should continue to reproduce the same kind under cultivation. I should certainly consider it worthy of continued experiments in that direction.

Respectfully,

EDWIN WILLITS, *Assistant Secretary.*

It would seem, then, that regarded from a scientific standpoint that such experiments presented nothing impossible in their scope.

In reviewing also what continually is coming under our notice, I cannot either see any reason why disbelief should exist as to some good being accomplished by this line of investigation. Rich and poor canes are continually coming to our notice from the same part of a field and where the conditions for their development seem to be as favorable to one as to the other. Anyone who has made a great number of single stalk analyses, as has been done here, is especially aware of this. It is also evidenced by the almost total impossibility of getting samples from a piece of standing cane which will accurately represent the whole plat. The extent of this variability can perhaps be better appreciated by comparing sugar cane with sorghum. a plant which has had a very unenviable reputation as regards the vagaries of its individual stalks. For this comparison I will insert here some tables compiled by Mr. Frank E. Coombs, for his report of sorghum culture on this plantation :

Comparison Sorghum and Tropical Cane as to Variability Among Unselected Single Stalks of Each.

Both grown upon Calumet Plantation, Louisiana, Season of 1889.

SORGHUM—LINK'S HYBRID. Ten (10) Adjacent Canes taken from the same row, November 4, 1889.						SUGAR CANE—"PURPLE" AND "RIBBON." Ten (10) Adjacent Canes taken from a Single row, November 4, 1889.					
No.	Cor'ted Solids.	Sucrose	Glucose.	Non-Sugar.	Exponent.	No.	Cor'ted Solids.	Sucrose	Glucose.	Non-Sugar.	Exponent.
1	22.20	17.04	0.71	4.45	76.65	1	15.67	11.91	1.82	1.94	76.00
2	21.39	16.18	0.45	4.67	75.64	2	16.77	13.91	1.25	1.61	82.95
3	19.88	13.98	0.63	5.27	70.32	3	15.17	11.10	2.16	1.91	73.16
4	21.85	15.77	0.65	5.43	72.18	4	13.10	8.72	2.26	2.12	66.64
5	21.85	16.25	0.53	5.07	74.37	5	15.87	12.64	1.46	1.77	79.65
6	22.25	16.70	0.73	4.82	75.05	6	15.89	12.64	1.67	1.58	79.67
7	21.68	15.59	0.62	5.47	71.91	7	13.83	9.74	2.28	1.81	70.64
8	21.41	15.81	0.68	4.92	76.10	8	14.62	10.93	1.71	1.93	75.10
9	21.68	16.50	6.68	4.50	73.84	9	15.53	12.32	1.49	1.72	79.33
10	21.18	15.53	......	......	73.32	10	15.06	11.41	1.90	1.75	75.76
Averages		15.94	0.64	4.96	74.00	Averages		11.54	1.80	1.81	76.17

Difference Between Extremes.

	Sorghum.	Tropical Cane.
Solids	2.37	3.67
Sucrose	3.06	3.92
Glucose	0.20	1.03
Non-sugar	1.02	0.54
Exponent	6.43	16.31

These tables showed a variability in sugar cane even greater than in sorghum, and gave me evidence of a wide range of selection in the work I proposed.

There is a belief among the Creole planters that the Ribbon cane as commonly grown in the State reverts to the Purple, though no scientific observations have been made to test the truth of the belief. Dr. Stubbs, at the Experiment Station, I believe, has had some difficulty in securing a pure stock of these two varieties, but has not attributed his trouble to one cane changing to the other. If there is any truth in the belief, it would suggest the probability that many of the existing varieties were derived in the same way instead of by sudden bud variation. If this were so it would add another link to the change of suppositions which led me to believe that the plant could be educated to meet our wants. Variation in fact seems to be the only law that we can depend on with safety at the present time. Why, then, can we not take advantage of this continual change and train it to meet our wants? If we cannot bring it to excel its original qualities, can not we, at least, keep its standard up to the quality of its present best individuals? If three-tenths of one per cent. of the weight of cane is added to it in sugar, a crop of 25,000 tons of cane would give 150,000 additional pounds of sugar, five-tenths of one per cent. would give 250,000 pounds additional, and one per cent. would add 500,000.

The labor entailed in a work of this kind is immense, and the scope limited as compared with sorghum or beets. Even when a stalk of exceeding richness is found it will produce but few canes, while sorghum sometimes gives hundreds of plants from one seed head. The effect on both stubble and plant must also be noted, and altogether a patience and unremitting toil brought into play that will make similar work on sorghum and beets seem insignificant when compared to it.

At Calumet 780 single stalks were examined, 424 of which were discarded by the Brix spindle work as being canes of medium richness, and the remaining 356 analyzed, giving about an equal number of the extremes of rich and poor canes. The canes from these analyses planted but two rows 575 feet long, while seed from the same number of stalks of sorghum would have planted many acres. We can see by this the Herculean nature of the task undertaken, and therefore the necessity for extreme care that the experiments be not lost. The selection cannot approximate averaging the extremes of value it would in sorghum, as the necessary amount of cane for further work could not be grown, did we allow it to do so. The average analyses of the rich canes planted here was solids 16.6, sucrose 14.7, purity 88.6; of the poor canes, solids 14.9, sucrose 11.9, purity 79.9. This gives a difference in the analyses of 1.7 solids, 2.8 sucrose, and 8.7 purity. This difference was not, perhaps, inherently as great in the canes examined as the analyses would indicate, for many of the stalks were no doubt influenced greatly by their environments, and after removing them from these, the peculiarities themselves would in considerable part disappear. These peculiarities due to environment would, probably, all be eliminated in time by continued planting of canes from selected plats. During November, 1891, at intervals of a week the plats were twice sampled. Samples were taken from directly opposite points of the two rows, and every stalk growing in the space sampled was cut. The analyses of each in the laboratory were, of course, made by identical methods. These analyses were as follows:

HIGH SUCROSE PLAT.

Analysis of November 20.—Solids	15.2	Sucrose 11.6	Purity 76.3
Analysis of November 27.—Solids	14.4	Sucrose 10.7	Purity 74.3
Average.—Solids	14.8	Sucrose 11.2	Purity 75.7

LOW SUCROSE PLAT.

Analysis of November 20.—Solids	15.1	Sucrose 11.1	Purity 73.5
Analysis of November 27.—Solids	14.4	Sucrose 10.7	Purity 74.3
Averag..—Solids	14.8	Sucrose 10.9	Purity 73.6
Difference.—Solids	0.0	Sucrose 0.3	Purity 2.1

There was also undoubtedly a less yield of cane from the poor sucrose seed. This was so very evident that it did not need the authority of actual weights to confirm it.

The results of these experiments were such as, at least, gave good reason for their continuance. I had hoped for the following year to select seed for further experiments from these two plats, but the canes were so very small, as combined result of cultural neglect and unprecedented drouth, that there was not enough material in any single cane for both analysis and planting. The experiments, as a consequence, had to be begun practically anew, with the loss of one year's valuable time.

1892 RESULTS.

In discussing the data secured the present year on this subject I have divided it into two phases, both of which seemed distinct and important enough for separate remarks. These are the results obtained from last year's selection and so have had but small opportunity for reversions, if such are to occur, and the other the results obtained from two plats, the original parents of which were from selected seed, the one from poor canes and other from rich ones—but in which they had been allowed to grow one year without any immediate selection. This latter, then, has been subjected to only the one original selection, but each plat kept free from intermixture with the other.

The seed selections for the first of the above-mentioned experiments were made during November of the fall of 1891. The cultivation, fertilization, and general treatment of the plats were left to the field manager, and it is but fitting to say here, that for the first year the plats were excellently cared for, and no small part of the value of the experiment is due to this.

The canes were planted two in a row without any lap and the tops and butts of the planted canes were kept opposite so as not to have the general growth of the cane in the row affected by the varying germinating qualities of the different sections of the cane.

The method used in selecting the rich and poor canes was somewhat different from that employed the first year. Then as a preliminary part of the work a number of tests were made to determine what section of the cane would represent the whole stalk, and having found this section, it was used for the analysis. But what has rendered this kind of work easier it was also found that from the point of comparing one cane with another any given section could be used, provided this section only was used in all the tests. So, acting on this knowledge, we have used in our selection the butt quarter of the cane, and while this does not give the sucrose contents of the cane planted, it gives an accurate comparison of the quality of the canes used. The test of quality is also made solely with the Brix spindle. This is amply sufficient with sugar cane when the cane tested all comes from one plat. I have hundreds of analyses on my books at Calumet, which it would be but an incumbrance to print here, showing without exception, that under such conditions a high per cent. solids invariably means a correspondingly high sucrose and, in a vast majority of cases, a higher purity than the lower solids. The average per cent. solids of the richer canes planted was 19.5, and of the poorer 17.2, a difference of 2.3. It was a most noteworthy fact that nearly all the richer canes were also the larger ones and the joints were longer than in the poorer canes. This would have, as the plats were the same length, given a larger number of eyes to the poor canes, and so should have given a larger number of canes, but from some cause it did not.

CANE GROWN FROM "SINGLE STALK SELECTIONS."

	Rich Cane Seed.	Poor Cane Seed.
Length of plat, feet	277.	277.
Number of mother canes	371.	350.
Number of suckers matured	504.	520.
Total number of canes	875.	870.
Number of canes per linear foot	3.2	3.2
Number of suckers per mother stalk	1.4	1.5
Number of canes died	14.	7.
Number of canes died per linear foot	.05	.03

ANALYSES.

Rich Cane Seed.				Poor Cane Seed.			
Date.	Solids.	Sucrose.	Purity.	Date.	Solids.	Sucrose.	Purity.
Oct. 24	17.0	14.0	82.3	Oct. 24	16.6	13.2	79.5
Nov. 1	17.5	15.2	86.9	Nov. 1	16.1	12.6	78.3
Nov. 5	17.1	13.9	81.3	Nov. 5	16.6	13.9	83.7
Nov. 7	16.4	13.4	81.7	Nov. 7	16.0	13.0	81.2
Nov. 8	16.3	13.2	81.0	Nov. 8	15.7	12.8	81.5
Nov. 11	16.1	13.1	81.4	Nov. 11	15.9	12.6	79.3
Nov. 12	16.6	14.3	86.2	Nov. 12	16.5	13.3	80.6
Means	16.7	13.9	83.2	Means	16.2	13.1	80.9

In the spring, after the canes had begun to appear in considerable numbers, they were counted in each row and this counting was continued weekly till the number of canes either remained practically stationary or began to decrease, and, finally, another count was made in the fall just before grinding. The last mother canes in each plat appeared during the week ending May 15th. The rich canes seem to have given their progeny a little the better start, as there were 371 mother canes against 350 for the poor canes, and this slight advantage in the number of canes continued into August, but at time of harvest the amount of canes in each plat was almost identical, the plat from rich seed having 875 canes against 870 in the other. Fourteen of the canes in the rich seed plat died before reaching maturity, and seven in the poor seed plat. In point of number of canes grown or those lost before reaching maturity no preference can be given to either plat.

I will now call attention to the relative amount of cane from the two plats. It will be remembered that last year, while no actual weights were made, it was remarked that the cane from the rich seed gave a larger, healthier looking stalk, this being so very pronounced that there was no mistaking it. This present year all the samples brought in were weighed, and as the same number of canes were taken from each plat at every sampling, and these samples extended through the whole length of the rows, a very good idea can be formed of the relative quantity of cane. This is best expressed by giving the average weight per stalk. For the cane from poor seed this was 2.58 pounds, and for the cane from the rich seed 2.42 pounds, a showing against the rich cane seed. While it may be that each year we will have a return in quantity similar to this, I am at present inclined to think that the rich cane will in the end prove the larger one.

It is true that with sorghum and beets the medium-sized plant is the most satisfactory one to grow for sugar; yet I believe that it could not in the same way be said of these that the smaller or medium-sized *seed* are as satisfactory for planting as the large ones, containing, as they would, a much greater amount of starch to be transformed into food for the young plantlets. So, I believe, it will be with sugar cane, and that the larger, healthier stalks will, in a series of years, produce the thriftiest canes, for I have continually noticed that in the selections the rich canes are the larger and better stalks. In regard to the results of the present year, I can say that the two plats were within three rows of the ditch bank, and that the poor seed was nearer to the ditch than the other. This may have given it an advantage, though I am not certain that it did. In three of the samples taken the weight of cane from the rich seed exceeded that from the poor, the other four samples giving opposite results. Also it was noticeable that at one end of the rows one plat contained the larger looking cane, and at the other end the other plat did, and the samples taken corresponded to this appearance. Certainly, from the limited trials made here, it would not be the part of wisdom to assert positively whether the rich cane seed will give a larger or a smaller cane, as the two years' results have been contradictory in this particular. Such contradictions, however, are to be expected in field agricultural experiments, and it will take the average results of a number of years to furnish ultimate proof.

We now come to the most important part of the work in judging of its utility, viz., the analytical results. Seven sets of analyses were made, and then it had become so late in the fall that it was deemed expedient to make the selections for planting, and as this took all the canes it stopped further analyses. The last analyses were made on November 12th. These samples were, with one exception, taken from directly opposite parts of the two rows and contained the same number of canes. The one sample taken differently was during the time the selections for further planting were being made and consisted of every thirtieth cane as the plat was being ground. This method of cutting out sections of the row in sampling standing cane for comparison of different plats I have found to be the most satisfactory tried. It is much better than going through the whole plat and trying to select average canes.

There is in these analyses but one case, that of November 4th, where the cane from the poor seed could be said to be better for sugar-making than that from the rich seed. The average of the analyses shows the cane from the rich seed to be eight-tenths of one per cent. higher in sucrose and 2.3 points higher in purity. Now let us see what such a difference in analyses means in sugar-making. Allowing ten per cent. marc, about the average in Louisiana, there would be a difference between the plats of 14.4 pounds of sugar in each ton of cane. This difference divided by two, because one plat was as much below the average cane seed as the other was above, will give 7.2 pounds of sugar per ton as an increase in planting rich cane for seed, instead of the average cane, had it been planted.

For a factory grinding 400 tons of cane per day this would add 2,880 pounds of sugar to the cane of a day's working, and for a crop of 25,000 tons would give 180,000 additional pounds of sugar. One hundred and eighty thousand pounds of sugar at five cents per pound is worth $9,000, and $9,000 would pay for 2,000 tons of cane at the price of $4.50 per ton, and 2,000 tons are nearly one-twelfth of the entire crop. This, it must be borne in mind, is the result of one year's selection. There is still another added value in the cane from the rich seed of which it is more difficult to give the exact value; this is the higher purity of 2.3. We know that a high purity is more desirable than a low one, but no one yet has been able to tell what a rise of a point in purity will add to the sugar output. To form some estimate we can take a given per cent. solids and figure what per cent. sucrose the two purities would give. Taking thus the average per cent. sucrose of the juice from the rich cane seed we will have the sucrose as given in the table of analyses for the cane from rich seed and 13.5 per cent. would have been secured on the cane from the poor seed plat had the per cent. solids been the same as in the other. There is, then, a difference of four-tenths of one per cent. of sucrose due to purity alone. Halving this for the same reason as given before, we would get two-tenths of one per cent. extra sucrose over the average, or 3.6 pounds per ton. This then should be added to the actual gain in sucrose made, aside from the question of purity, and would give instead of the 7.2 pounds, 10.8 pounds additional sugar per ton of cane. Carrying this out in figures the same way as before we would have for a day's work of 400 tons, an increase of 4,320 pounds of sugar, and on a crop of 25,000 tons 270,000 pounds. This, at five cents per pound, amounts to $13,500, and would at the rate given before buy 3,000 tons of cane, which is but little less than one-eighth of the entire crop. Expressing this gain in another way it would give an abundant amount of money to pay the sugar house labor for manufacturing the crop. This result was obtained from planting canes the average per cent. solids of whose juices differed by 2.3 points, thus making the richer canes better than the average would have been by 1.15 per cent. It is undoubtedly a remarkable showing.

ORIGINAL SEED SELECTION WORK.

We turn now to the other phase of our subject in which one year had intervened without selection since the original selection was made. As explained, this was because the cane was too small to analyze a part and still have some left for planting. It will be seen then that the canes analysed this year while of pure bred stock from the original rich and poor canes has not the added value that another year's selection might have given. The results, however, should be expected to be very interesting in having a bearing on the question of the stability of an improvement once made. This will of course be one of the most important phases of the subject, for, should any improvement made revert to the original state after one year, the work would be in vain, as enough cane cannot be selected in one year to be of any great value.

The first year's work with these plats gave a difference of three-tenths of one per cent. of sucrose between them and of 2.1 points in purity. This of itself was a decided improvement, but as the cane was so small I placed no great reliance in the results, thinking that an accidental cause might have occasioned it. But during the present year the cane from the seed these plats furnished grew excellently and was well cared for, so we are thus given an excellent means of judging what one year's selection will do under continued propagation.

CANE FROM "SINGLE STALK SELECTIONS."

Grown two years without additional selection.

RICH CANE SEED.				POOR CANE SEED.			
Date.	Solids.	Sucrose.	Purity.	Date.	Solids.	Sucrose.	Purity.
Nov. 3	18.0	16.0	88.9	Nov. 3	17.6	15.5	88.1
Nov. 8	17.7	15.4	87.0	Nov. 8	16.8	13.5	80.3
Nov. 14	17.1	15.3	89.5	Nov. 14	17.5	14.5	82.8
Nov. 19	17.5	16.3	93.2	Nov. 19	17.5	16.2	92.6
Nov. 25	17.6	16.0	90.9	Nov. 25	17.9	15.8	88.3
Dec. 6	18.8	17.0	90.4	Dec. 6	17.8	14.8	83.1
Means..	17.8	16.0	89.9	Means..	17.5	15.1	86.3

The average sucrose of six samples from the plat planted with rich cane seed was 26.0 and the purity 89.9. The cane from the poor seed gave a sucrose of 15.1 and a purity of 86.3. The samples were taken in the same manner as in the other plats and, as will be noticed, give a more favorable showing than they did for seed selection. I will not extend the figures as I did before, for their magnitude must already be so apparent that further discussion would be useless.

A most important point these two plats show is that the higher sucrose from the rich cane seed is not an early forced maturity. The analyses extend up to December 6th, and there is as marked a difference in the later ones as in the earlier. I cannot but believe then we have proven that under the same conditions for each kind of seed, no difference what these conditions are, a rich cane will produce a better progeny than a poor one.

Having established the fact that cane can be improved by systematic seed selection it is necessary to inquire how this can be made of practical value to a large cane grower. The results obtained have been with small experiment plats. How can such work be done for hundreds of acres ? This must be the true test of the utility of the results, for could not the large field profit by them they might as well have never been made.

There are two possible ways, it seems to me at present, that the knowledge acquired by these experiments can be put to practical use. The first of these is by systematically sampling the cane growing on different sections of the plantation, and planting the richest for the ensuing crop. In this case, however, the conditions giving the richness are not perpectly known ; the soil, fertilizer applied, better drainage or cultivation may, one or all, have had an effect in giving the result, instead of an inherent quality in the cane itself, and that which is in reality poorer might be selected in one year's work as the better. In a number of years though it is more than probable that a selection of this kind would be of material benefit. The return would in any case be slower than the method I will now call attention to.

A chemist can take ordinary unskilled white laborers and teach them the necessary Brix readings in a very short time, and by single stalk work I estimate, from the work done here, that in a month at least three acres could be planted with a high quality of seed, using only a single hand-mill to extract the juice. This work done during grinding would entail no loss, as all juice extracted and canes not selected could be used in the factory. These three acres should produce the next year at the rate of twenty tons per acre, or a total of sixty tons. At the end of one year, then, sixty tons of a high-grade seed would be on hand. This, planting at the rate of four tons to the acre, would seed 15 acres, and with the three acres of stubble, would at the end of two years, give 18 acres of pure-bred seed. The 15 acres of plant cane would give 300 tons, at the rate of 20 tons per acre, and the three acres of stubble, at 16 tons per acre, would give 48 tons, a total of 348 tons, which is enough to have at the end of the third year, with the 15 acres of stubble, 92 acres of pure-bred seed. This does not take into account the additional selections that could be made each year and which by three years would at the same rate as above give twenty-one additional acres. One hundred and thirteen acres would, in round numbers, plant 550 acres, and this nearly as much as our largest plantations plant in one year. By the end of another year, or the fifth crop harvested since the selection was begun, there would be nothing but improved cane on the place. This would be accomplished, too, by using only the additional labor of perhaps four men during the grinding season.

Of course continued selections, that is selections from selections, could be going on in small plats all the time and as these became of sufficient value could be transfered to the field in the same manner as the other.

I can not more fittingly express my belief in the absolute advisability of this work than by urgently recommending that it be begun on this plantation the approaching crop.

Feeling thus so thoroughly assured that selection of "high sucrose" canes will give a plant which is also of a superior quality, it might be well to speculate as to how far this improvement can be carried. Is it to be stopped at the end of three or four years, or is it to be continued indefinitely? If for the shorter period how much of an improvement can we expect?

We know that propagation from cuttings will produce plants much truer to their mother species than those grown from seed. This is exceptionally true of those plants that can be grown in either way. As, for example, all fruit trees are budded, potatoes are grown from the eyes of the potato, not from the seed, and in the last few years when tropical cane seeds have been secured many distinctly different plants were, according to Professors Bovell and Harrison, grown from one parent seed head. Beet investigators, also, realizing this fact, have been making experiments in growing beets from what are practically cuttings, instead of from seed as heretofore; their work is being done to preserve two varieties rather than to have any immediate effect upon the sucrose content. Then having accepted the facts that cuttings breed truer to the parent than seeds, is not the conviction forced upon us that an improvement inherent in the plant can be developed more quickly in cane than in seed-producing sugar plants. I do not mean by this that large quantities of a pure stock could be secured more quickly, for I have already explained why this can not be done, but that with an equal number of stalks a plant true to its parent stock will reach its maximum sucrose content sooner, and breeding only from the best, we are more apt to get the best. We will not have to contend with the difficulty of variation from our accepted best value. It is, also, doubtless true from the same reason that we are more limited in our ultimate improvement since we cannot expect accidental variations that will be of more value than their original parent. We can not, either, secure any of the benefits of crossing that are obtained from seed-bearers. That there are occasional variations, however, any one familiar with the investigations of naturalists of the present day can not very well doubt; indeed some have actually been observed in ordinary culture, and are now being grown at the Sugar Station, this State; but it can not be hoped even by an extreme visionist in natural selection that there would be much betterment in cane by watching for such variations. My own work, no further than it has gone, has led me much against my will to fear that the chance for continued improvement from single stalk selection is not as great as could be desired. I do not find nearly the variation in the plats which have already been subjected to one selection that I did in my original selection from the field. Where the first year the difference in per cent. solids of the two plats planted was 2.2, the selections gave but two slight individual variations in either plat, and there were in each case practically the same number of canes examined. All the canes from the high sucrose plats were correspondingly high and those from the poor plat correspondingly poor. There was not in the rich plat a single stalk that I could think was distinctively richer than its associates from any quality in itself; in fact there were none at all that were markedly superior canes to those adjoining them. I do not think the same reasoning could be held as good in regard to the cane from poor sucrose seed, as some single cane might be unusually low in sugar from an accidental cause, such as becoming wounded during cultivation, etc.

Darwin says there is no evidence of the existence of any law of necessary development, and if this is the case, then we will have but another evidence that the plant we are experimenting upon will not repay our labor to the extent that a seed-producing plant would, for it hedges us more closely into the condition of looking for continued improvements in individual variations, and, as above remarked, we cannot expect but very few of these. Yet it may be that sugar cane is not so badly handicapped as may seem in its lack of seed-bearing qualities. There is no doubt that a variety of any seed-bearing plant having its distinguishing characteristics once fixed, does not offer anything like the number of variations that it did while striving to reach this goal. The influence this fact would have on beets and sorghum, the competitors of sugar cane, is that, having isolated a true variety of either and given it a reasonably good sucrose, this sucrose does not keep on increasing in anything like the same ratio it did while it was being brought from its impure parent stem. In other words there is a limitation to improvement, and the nearer the limit is approached, the slower is the progress. I, of course, am not considering the extraneous influence of rainfall, temperature, cultivation, fertilization, etc.

It is my belief, then, that with a given amount of plants the improvement in sugar cane by seed selection will be more stable than in sorghum or beets, and will, on the whole, approach its maximum more rapidly, but that the limitations to its ultimate improvement are greater than in either of these. Nature, however, may aid it in the fact that the production of sugar is a function incident to the plant, while with beets and sorghum this is an educated quality. Time only can tell which of these three will ultimately excel in the world's sugar production, but whatever the outcome will be it is certain cane can take a great stride in the race, now that it has been found that seed selection will aid it.

REVIEW OF WORK DONE, AND RECOMMENDATIONS FOR THE FUTURE.

At the end of three years' work it is perhaps fitting that a slight review of the work accomplished by these agricultural experiments should be given, for we can then the better judge of the value of continued experimentation.

In the experiments on varieties the work was begun on eighteen different kinds, and these have been narrowed down by selection of the fittest to three. Two of these, the Tibbo Merd and Uwala, at least give evidence of becoming sufficiently valuable to in time supplant the canes now grown here, and they certainly can already be considered as competitors. They are both what in Louisiana are called white canes, though in reality at the time of harvesting here they are much more nearly of a green color than any other. In point of size and weight they are eminently satisfactory so far, and in general healthfulness all that can be expected. What has been done as affecting the quality of the varieties kept can best be shown, perhaps, by comparing the purity of their juices at the same date for the different years.

The Pupuha on November 14, 1890, had a purity of 78.9, this being the latest date on which the cane was analyzed that year. The only analysis of 1891, that of November 21st, gave a purity of 84.3, and in 1892, November 19th, the purities for the two plats were, respectively, 84.5 and 83.3. It must be remembered, however, that the year 1891 does not accurately represent a fair condition of the cane, for untoward weather and lack of cultivation, probably untimely checked its growth, and made a higher purity than there naturally would have been. The cane, though, has certainly improved, for on approximately the same dates of the first and last year's cultivation there is a difference in purity in favor of the latter of five points, the average of the two analyses of the same date the last year being taken for the comparison.

Comparing the Uwala in the same way we find on November 14, 1890, a purity of 76.4; on November 21, 1891, 82.7, and on November 19, 1892, 86.2, a raise of nearly ten points in three years, which is certainly a remarkably good showing and one that might lead us to expect more of this variety in the future than of any other. It is also notable that the last year the lowest purity is higher than the highest of the first year and this, too. with an analysis made a week earlier than any made then.

With the Tibbo Merd it is hardly fair to compare any of the samples taken this year at the large mill with those of previous years which were all from the small mill, though indeed even in this case an increase of from one to two points is shown on comparative dates, but the truer comparison is to use only analyses of juices expressed by the small mill. On October 31, 1890, the purity of Tibbo Merd was 75.3, and on November 1, 1892, it was 83.8, a raise of 8.5 points.

These analyses indicate a very rapid advance in these three varieties in becoming acclimated, and unless they have already reached the maximum they will attain here, which is not at all probable judging from their rapid rate of improvement, it would seem almost certain that they will surpass our native canes in a very short time.

The work in which the most has been accomplished and which gives the greatest promise of future benefit is the seed selection by single stalk analysis. It is not necessary to again give the result of this work but in order to express the esteem in which it is held I will say that more has been accomplished in three years than I had at the beginning of the experiments hoped for in ten years. Indeed it was a matter of speculation whether such an experiment was at all likely to prove of any benefit whatsoever. All this work, and it has been of no small amount, has, with the exception of a small amount of manual labor, been done by the regular laboratory force.

I have, in the face of these results, decided to continue for next year's experiments, the foreign varieties of Tibbo Merd, Uwala and Pupuha, and have also added to the variety experiments the three native canes, Purple, Ribbon and White.

Experiments looking toward deciding the proper quantity of seed cane to plant have been begun, and one row each in which one, two and three canes, respectively, are planted, have been added to the experiments.

The high and low sucrose plats are continued with seed selected from the present year's corresponding plats, and interesting results can certainly be looked for from them.

These complete the plats as planted for the coming year's experimentation, but I have already formulated plans suggested by studying the data in this report, which, it seems proper to me to insert here, especially as it will allow the study and discussion of them one year before they are put into execution, if they are decided to be of value.

I propose to make seed selections of all the varieties continued for experimentation, for it seems to me that this is the only way to decide on their ultimate superiority. It may very readily be the case that one variety is much more susceptible to this improvement than the other. Indeed, a variety which, without selection would seem inferior, might, with selection, prove the most valuable. This has been the case with sorghum, for, formerly, Early Amber for the earlier crop and Orange for the later, were the standards, and now, with only a few years' single stalk seed selection, these have been supplanted by Folger's Early and Colman, or Collier, respectively. I do not, with these varieties, propose to plant plats of both rich and poor canes, for this was done to test whether improvement could be made, but only of the rich cane, for it has already been demonstrated that the improvement can be made.

The experiments in which one, two and three canes are planted per row present some peculiar difficulties in deciding how they should be conducted. I, at present, think that each succeeding year these plats should be planted with seed from the corresponding plats of the previous year; but it certainly is at least possible that such a plan might produce a cane different from that generally grown. For instance, the plat planted with one cane per row might, in time, become educated to sucker more freely than the others, and, of course, as we now view suckering, this would be an advantage, but it would practically be the same as introducing a new variety and would not in that case answer the aim for which the experiment was begun. If no change of this kind will be induced by conducting these experiments as I have outlined them, then it is undoubtedly the proper way; but if the change will occur, then it might be the best plan to each year select fresh seed on which no experiments of this kind have been made. To do both would, of course, be the better plan, but the capacity of the laboratory is limited, and for this reason I have selected the plan first given.

In the matter of planting stubble and plant cane there is a worse complexity than in experimenting upon the number of canes to plant per row. We can either get plant and stubble cane each year from different parts of the plantation, or we can plant from the plats themselves, by using for continued planting of stubble-seed plats the stubble cane grown from stubble seed, and for plant-seed plats plant cane grown from plant seed. This may seem somewhat complicated at first sight, but a little study will show that it would not be a difficult thing to do, and would entail no extra work. As it is now, we have two sets of plats—stubble and plant cane—and with this plan I propose no great amount of extra work would be done on the plant cane from stubble seed or the stubble cane from the plant seed; for the seed selection work, which would of course be done in any case with these experiments to make them conclusive, would only be made on the stubble cane from the stubble seed and the plant cane from the plant seed. These experiments would, if it is found possible to do so much work, be made with the same plats in which the varieties are being tested. If, for these experiments, cane from other parts of the plantation was used each year, the stubble and plant, of necessity, could not be secured from the same ground, and for a single year's trial, as it would be in each case, this might have a very material effect upon the seed and thus upon the cane grown from it.

As I would like to conduct these experiments can best be shown, perhaps by the following diagram :

Tibbo Merd	Plant seeded with ~~selected plant cane.~~	Stubble, not used.
		~~Plant seeded with~~ selected plant cane.
	Stubble seeded with selected stubble cane.	Stubble, seeded with selected stubble cane.
		Plant, not used.
Uwala	Plant, seeded with selected plant cane.	Stubble, not used.
		Plant, seeded with selected plant cane.
	Stubble, seeded with selected stubble cane.	Stubble, seeded with selected Stubble cane.
		Plant, not used.
Purple	Plant, seeded with selected plant cane.	Stubble, not used.
		Plant, seeded with selected plant cane.
	Stubble, seeded with selected stubble cane.	Stubble, seeded with selected stubble cane.
		Plant, not used.
Ribbon	Plant, seeded with selected plant cane.	Stubble, not used.
		Plant seeded with selected plant cane.
	Stubble, seeded with selected stubble cane.	Stubble, seeded with selected stubble cane.
		Plant, not used.
White	Plant, seeded with selected plant cane.	Stubble, not used.
		Plant, seeded with selected plant cane.
	Stubble, seeded with selected stubble cane.	Stubble, seeded with selected stubble cane.
		Plant, not used.

Purple, 1 stalk	Plant, seeded with selected plant cane.	Stubble, not used.
		Plant, seeded with selected plant cane.
	Stubble, seeded with selected stubble cane.	Stubble, seeded with. selected stubble cane.
		Plant, not used.
Purple, 2 stalks	Plant, seeded with selected plant cane.	Stubble, not used.
		Plant seeded with selected plant cane.
	Stubble, seeded with selected stubble cane.	Stubble, seeded with selected stubble cane.
		Plant, not used.
Purple, 3 stalks	Plant, seeded with selected plant cane.	Stubble, not used.
		Plant, seeded with selected plant cane.
	Stubble, seeded with selected stubble cane.	Stubble, seeded with selected stubble cane.
		Plant, not used.

By adhering to this plan three different experiments can be carried on at the same time with each plat, the first to test varieties, the second with stubble and plant cane for seed, and the third to make seed collections. It would be the most economical method I have seen mentioned to make these experiments.

It seems to me that the time for fertilizer experiments in field plats has not yet arrived, for they would introduce many new complications into a business that is already too complicated. Such experiments, I believe, could be made valuable here with the proper care and attention, but I do not think that these could be given under existing circumstances.

Altogether, from the experiments I have proposed, it can be seen that the original plan of trying nothing but what gave promise of some immediate return has, in a measure, been discarded. The conditions at present are, however, different from those at the time this plan was made. It can now be accepted as certain that if the Louisiana sugar industry is to live at all, that chemistry will necessarily play an important part in it, and so, on this plantation, whether the present laboratory management remains or not, some one will be here and the experiments can be continued in the same general lines If all is done that I desire the work of the laboratory will be considerably increased, but I believe, with the experience gained by our previous work, no extra labor but that of a manual kind will be needed, and this in the future, as in the past, I feel certain will be furnished when the laboratory asks for it.—*Calumet Plantation Field Experiments with Sugar Cane, 1893.*

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ELECTRICITY IN CLARIFICATION.

[The Sugar Cane.]

Some little time ago the chemist attached to the Experiment Station of the Vienna Central Verein fur Rubenzuckerindustrie was instructed to make experiments and report with regard to the action of the electric current on beet juice. The report has been published and the summary of results is as follows:

The action of the electric current produces an elevation of the quotient of purity.

It precipitates large quantities of nitrogenous substances.

When zinc electrodes are used, some zinc enters into solutions; the juice treated with electricity has a strong alkaline reaction.

The ability of the juice to reduce copper solutions is not increased by electric treatment with zinc electrodes.

The purifying action of the electric current is considerably increased when it is employed with juice which has been partially deprived of its non-sugar by being heated to 75 deg. C., and then filtered.

The zinc combinations cause very little impurity in the juice.

The juice treated with electricity can be defecated with a less quantity of lime than that not so treated.

The carbonated juice from green syrup treated with electricity is lighter in color than that from green syrup simply defecated with lime.

IS DIFFUSION THE PROCESS OF THE FUTURE?

[THE SUGAR CANE.]

Such a question implies rank heresy so far as concerns the future of the cane industry, but it is one which is gradually forcing itself upon the attention of sugar manufacturers. The maceration process to which we alluded in May of last year is being adopted not only in Queensland, but in Louisiana and other cane-producing countries as well. It is the compromise—said to be so dear to the Englishman—between diffusion and dry crushing, and events tend to show that the results obtained by the compromise threaten to wrest the laurels for good work from diffusion. The imbibition of boiling water between the rollers, and the conservation of the heat up to the time the megass enters the second rollers, have been brought to a perfection in Queensland not yet attained in other countries. Adequate saturation of the megass is obtained in this process by the addition of water to the extent of 40 per cent. to 50 per cent. of the juice, and thus many of the advantages of diffusion have been secured without the delay attached to that process. The questions which manufacturers ask themselves are:—Is a diffusion plant cheaper? Does it cost less to work? And are better results obtained by that process over all others? It has generally been considered that the installation of a diffusion plant is more costly than that of crushing plant with the simple apparatus required for maceration and some form of comminutor or shredder. However, on this point further information is necessary, and a modification of views formed a few years ago may be advisable. As to whether the process of diffusion is the more expensive there seems no room for question, the increased cost of evaporation, the loss by inversion, and the large amount of labor required, alone being considerably in excess of the same features in the crushing-*cum*-maceration process. As an instance of the extra cost of fuel we find that at Kealia, in Hawaii, in addition to the megass used there was required five hundredweights of coal to every ton of sugar made, whereas it is possible in Queensland and Demerara to manage with megass only. Yet this is only an item in the bill of costs which goes to make up the undenied excessive cost of diffusion. But the main question to be considered is that of the results obtained, as it is on account of the alleged superiority of these that it is so commonly said that diffusion is the process of the future. Cane sugar manufacturers ask themselves what is the percentage of sucrose extracted by diffusion? Kealia, alluded to above, in its 1891-92 season obtained 96 per cent. (See PLANTERS' MONTHLY for November, 1892.) In Cuba the process was bitterly criticised, and it was repeatedly claimed that the crushing mills obtained 3 per cent. more sugar than the two diffussion plants. (See *Sugar Cane*, June, 1892.) We believe that if we take 96 per cent. as the extraction of sucrose by diffusion, we shall not be underrating the present capacity of that process. Now what can the crushing mills do? In May last when we said they could extract 90 per cent. and over, the figure was objected to as exceptional. However, in discussing such a question as this, it is only reasonable that we should take the exceptionally good cases from each side, other things being equal. On the Belle Alliance Plantation in Louisiana (see PLANTER, November 12th, 1892) an extraction of sucrose of 87.54 per cent. was obtained, and at Habana, in Queensland, an average of over 89 per cent. was shown in 1891. But another season has passed in Queensland, and evidence has been forthcoming that on its own ground (that of extra saving) diffusion has been caught in the race. We are now positively assured that with complete maceration—and of course some form of shredder—as high as 96 per cent. of the sugar in the cane may be secured without diffusion. Further than this we venture to predict that when water is also added between the shredder and the first rollers an extraction of not less than 97 per cent. will be found possible. Such being the case, exceptional, of course, but possible of accomplishment by all, the advantages of diffusion stand severely challenged. It has long since been demonstrated that it would never pay to throw out a big crushing plant for diffusion, and unless convincing arguments are forthcoming to the contrary, we fail to see that diffusion must of necessity be regarded as the process of the future.—*Sugar Journal and Tropical Cultivator.*

THE SILVER QUESTION.

[CORRESPONDENCE OF THE "SUGAR CANE."]

Before 1873 this question was unknown, at least in its present bearing or aspect. The action of Germany in that year induced France to close her mints to the free coinage of gold and silver, and thus brought into view the inevitable consequences of England's mistaken policy when, in 1816, she adopted gold as the sole legal standard of value. Its ruinous results would have become apparent at once if France had not in 1803 established a joint gold and silver standard with open mints, for the free coinage of gold and silver at a fixed ratio of 15½ oz. of silver to one ounce of gold. France continued to do for all the world what England, after 1816, refused to do, and through the action of France, England still enjoyed the benefits of the joint standard which had existed in this country since 1257. This bimetallic law of France from 1803 to 1873 sufficed to maintain a steady ratio of 15½ to 1, although during these seventy years, at certain periods, the production of silver exceeded the production of gold by three times, and at others, three times more gold was produced than silver.

Thus silver was international money, with a fixed ratio to gold; but in 1873, it ceased to be money for international purposes, because the connecting link, the fixed ratio between the two metals, was broken. Silver standard countries like India, China, Japan, Mexico, etc., could no longer pay in money, but only in silver metal, by weight, worth more or less according to the supply and demand. Silver became a commodity, and instead of buying and selling in money, all dealers with silver standard countries had to resort to barter, giving or taking commodity against commodity. For international purposes, silver money was "wiped out" of existence; gold alone had to do the work previously done by gold and silver conjointly. Hence the "scramble for gold" and the steadily increasing value of that metal, as measured by commodities. All international debts payable in gold mean an ever-increasing quantity of commodities to discharge these debts. Whoever has commodities to sell must suffer from this continuous "appreciation" of gold, and it is self-evident that producing industries in gold standard countries cannot possibly prosper under such conditions. The "fixed income" classes alone are benefitting by the present condition of things; but there can be no justification for giving them more than their just due, or for robbing the industrious for the benefit of "the idle."

Lower prices in themselves are no evil, but the contrary, provided they are the natural result of cheaper production or of a more abundant supply. They are an evil if they result from a contraction of the currency, when by an artificial money law, a monopoly is given to one metal to the detriment of all commodities, and by making useless for international purposes one-half of all the money in the world. This evil becomes all the more evident and presses harder upon the industries in gold standard countries when they are put in competition with the same industries in silver standard countries. In the latter all local purchases, wages, etc., are paid in silver, and thus a bonus exists in favor of these industries as compared with their competitors in countries where all payments have to be made in gold. It is for this reason that in England, the farming, cotton and similar industries competing with Eastern producers have become unremunerative. It is Protection in another form, and there cannot be real "Free Trade" unless all competitors are placed on the same basis as regards the measures of value.

Gold and silver should be legal tender money in all countries of the world; capital would then flow freely to wherever it could find profitable employment; the Eastern countries would then be developed, and money would command a fair rate of interest instead of lying idle, as at present, through fear of losing part of the capital by a further fall in the exchange if employed in silver standard countries. Business would then cease to be a gamble, as it is at present, when neither buyer or seller in silver money knows beforehand what the price will represent in gold. Whilst all the drawbacks of the present system are so evident, whilst our producing industries are slowly but surely being ruined, whilst the state of all trades clearly points to the required remedy, still many people are afraid of adopting the system which worked satisfactorily when in force, and, at the same time, it has not yet been shown that one person would be hurt in his legitimate interests if we reverted to the bimetallic system in operation before 1873. What France did single-handed for seventy years cannot be impossible under an international agreement. The question of the particular ratio to be adopted may safely be left to be settled by international agreement, once the principle of bimetallism is conceded. As the present rate of production is about 20 to 1, and as the total stocks of both metals are in the proportion of about 18 or 19 to 1, it would seem a safe basis to adopt a similar ratio, or at least one which has not been exceeded in the total production of both metals from the earliest time up to date.

That a single gold standard has no special advantages as a means of encouraging trade is best shown by the trade returns of the United Kingdom, which for 1844 were 183 millions sterling. In 1872, when Germany demonetised silver, they had grown to 669 millions, whilst in the succeeding twenty years, when we ceased to have the benefit of the bimetallic law, they only grew 46 millions, namely, to 715 millions. On the other hand, the industries of silver standard countries have developed increased prosperity, as shown by the astonishing growth of the cotton mills in India, Japan, etc. Competition on the part of gold standard countries gradually becomes impossible, and whilst the cotton mills in the East pay handsome dividends, one hundred of the best and newest Oldham mills for the last fifteen years only show a return of less than 1½ per cent. per annum on the responsible capital, or about one-half of what an investment in consols would have yielded! Farming land in England is going out of cultivation, whilst the Indian farmer prospers. The low sterling gold price does not represent less money in rupees to him, but on the contrary, a further fall in exchange whilst the particular transaction is pending means an extra profit to him.

For the first time in the course of history the tonnage of British shipping shows an actual decrease, according to the latest return published. No wonder that, under these conditions, and with these clear proofs of declining trade, public opinion in England is rapidly coming round to Bimetallism. A few years back, a discussion on bimetallism would have been treated as a joke, whilst the last quarterly meeting of the Manchester Chamber of Commerce showed an overwhelming majority in favor of the joint standard by international agreement. Practically, all the English professors of political economy are on the side of bimetallism, and the Trades Union leaders look upon it as a bread-and-butter question for those employed in our producing industries. Even men like Archbishop Walsh and Mr. Leonard Courtney have felt compelled to openly declare in favor of the bimetallic doctrine. and the conversion of the latter means an actual majority for bimetallism of the members of the Royal Commission of 1888. The last division in Parliament on bimetallism showed an apparent majority against the bimetallic cause, but only because, at the last moment, the Government made it a Cabinet question. and thus compelled even some of the vice-presidents of the League to support Home Rule in preference to bimetallism. We have it on the dictum of Sir W. H. Houldsworth that but for this action of the Government, a clear majority would have been shown in favor of bimetallism. Out of the eight members of the late Cabinet in the House of Commons, six voted in favor of Sir H. Meysey-Thompson's resolution, and if only Her Majesty's present advisers read correctly the signs of the times, there ought to be little difficulty, on the re-assembling of the Brussels Conference, in agreeing upon some plan which, if it be not bimetallism pure and simple, at least tends in the direction of establishing one universal standard or money measure in both metals.

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A NATIONAL IRRIGATION CONVENTION.

A convention consisting of between two and three hundred delegates from western and Pacific sections of the United States convened at Los Angeles on the 14th of October, to discuss matters pertaining to irrigation. The people of California having been among the first to demonstrate the value of irrigation on arid lands, that state naturally took the lead in calling and providing for such an assemblage, to discuss the best means of securing state and national aid in directing this great work of turning the waste waters of Rocky mountain streams to become a source of wealth instead of being wasted by their natural flow to the ocean. Besides delegates from the various states, there were representatives from Russia, France and other countries.

Seventeen states and territories selected delegates to this convention, which met at the chief center of the irrigation region of California, Judge J. S. Emery of Kansas being chosen president, and the entire week was spent in debating the various topics brought before it. The report presented by ex-Governor Sheldon embodies the views of the convention, and we insert a few extracts from it, as they possess interest here, where irrigation is practiced in our various agricultural industries, though not to the extent that it is in the United States.

Writing to an American friend many years ago, Macaulay said: "Your national safeguard lies in your boundless public domain. You now have room for the spread of population and the satisfaction of every man's desire for land, but the time will come when this heritage will have been consumed, this safeguard will have vanished. You will have your crowded Birminghams and Manchesters, and then will come the test of your institutions."

Existing social and industrial conditions in the great cities of the East and middle West remind us of the alarming increase of the class of homeless people within the borders of the United States. To provide a further field or colonization under conditions which promise a good average prosperity to individual citizens, by the utilization of the great public estate still remaining in the hands of the government, is in our judgment a work which must now appeal with irresistible force to American statesmanship.

The public lands which still belong to the people of the United States lie between the 97th meridian and the Pacific Ocean, and are divided among seventeen States and Territories. This domain is estimated by the General Land Office to contain 524,000,000 acres. Enough of this land is arable to provide homes and farms for millions of people. The portion which can never be cultivated is valuable for range purposes or for forest reservations. These lands are the heritage of the American people. To have a home upon them is the birthright of every American child. The conditions under which they shall be reclaimed and acquired by the settler must be founded on the recognition of these facts. There are also questions between States which require national legislation and oversight, and however Western men might desire to settle the problems which nature has placed about them, the result cannot be attained except through national legislation.

We declare that water in natural channels and beds is not private property, and that it can neither be bought nor sold. Companies for supplying and distributing water are common carriers, subject to the supervision and control of the power from which they derive their rights.

We declare that all streams rising in one State and flowing by natural courses through one or more other States, must be conserved and equitably divided under Federal authority.

The time has come when the work of developing an arid land policy, on broad national and State lines, can no longer be delayed.

Governor Sheldon, in commenting on the report, said: "It declares that so far as the public domain is concerned it is a national question. It should have the consideration of the national government, and the waters of the streams which arise upon the public domain should be under the control of that government. It declares that streams which run from one State to another, or into one or more other States, are national, and the distribution of their water must be under national supervision."

Major J. W. Powell, representing the Interior Department of the U. S. Government, on being invited to speak, said that from a local standpoint there was enough water for irrigation, but making the statement a general one he felt that he was right in stating that there was, in the arid region of the country as a whole, only enough water to irrigate the lands at present owned by private individuals, without extending the irrigation to the lands now owned by the government. He said he considered carefully as to whether or not he should make such a statement at this congress. He felt, however, that it was his duty to do so, for if further government lands were ceded to private individuals for irrigation purposes there would then not be water enough to go around, and an endless heritage of litigation would be the result.

This statement caused great indignation in the convention, as it was contrary to the general opinion of those present, who thought that the supply of mountain water was unlimited, if all the rain water that fell was secured for irrigation—which was an impossibility. Major Powell reiterated it, and believed the test would prove it to be true.

Commenting on the work of the convention, Judge Emery, the presiding officer, stated after its close: "The Los Angeles congress has inaugurated a movement for the successful irrigation of arid America that must be fruitful of the best results. In the immediate future, it seems to me, arid America is bound to afford happy homes for millions of happy people. I shall return to the Sunflower State full of the belief that the labors of the congress will eventuate in the accomplishment of all that the most sanguine friends of irrigation can hope or can desire. Kansas and California have joined hands across the everlasting mountains in an effort for bettering the condition of hundreds of settlers in arid America."

Judge Vanderwerker of Arizona said: "The practical results will be to place irrigation in a correct light before the farming and financial world. The results will tend to convince the farming community that forty acres under irrigation is a richer heritage than a section of land under rainfall. They will show the financial world that irrigation securities for safety and profit are unsurpassed."

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THE VEDALIA'S FIRST COUSIN.

The fight of the vedalia against the white scale of California's orange groves was a tragedy that attracted wide attention. The battle was something like that skirmish at Lexington whose shots were heard around the world. The success of the experiment of fighting pests with parasites advertised California horticulturists as progressive men who proposed to push their industry on scientific lines. When a scientist from the Berkeley University was in Paris recently he was asked a thousand questions about the curious fight of the insects and he heard many compliments for our fruit-growers and their wide-awake methods.

The latest candidate for fame in this direction is a steel-blue lady bird that is working in the same lines of voracious industry as its cousin, the vedalia. The new parasite is known in books as *orcus chalybeus.* Its special foe, for which it has a three-ply appetite, is the red scale of orange trees, a pest that the vedalia has no special fondness for. The red scale, which entomologists call *aspidiotus aurantii*, is as deadly to an orange tree as the white scale, and it has worked disaster in many groves. The orcus was one of the later importations of Mr. Koebele, the Government entomologist, who brought the vedalia from Austratia. Late news from experimental groves in the South say, the insect warriors are multiplying rapidly and settling down to business. As each orcus family at the end of the season numbers usually between 2,500 and 3,000. the chances for a steady growth of the colony now seem good.

News comes, also, of the favorable work of a parasite that is preying upon the black scale of olive trees. It has a name longer than the Nawab of Rampur, but it has an active appetite and Mr. Cooper from Santa Barbara says it promises to do great things.—*S. F. Paper.*

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THE PERFECT HORSE.

The perfect horse is yet to be foaled, and we must take facts as they are, and not expect to find all good qualities in any one horse. In dealing with a stranger rely largely on your own judgment, and endeavor not to be misled by any questionable statements he may make. See that the horse stands squarely on its feet, and that it does not toe out behind, or toe in forward. Run your hand slowly and carefully down the inside of each leg; if there is a bunch there you will feel it. See that the feet are sound and well spread. A dark hoof, if sound, is always preferable to a white or streaked one. Look sharp at the eye. A bright full eye denotes spirit; a mild, pleasant eye, with a brownish cast, indicates a pleasant, affectionate disposition, while an eye with a good deal of white denotes temper. There is, perhaps, no other way to judge a horse's disposition so well as by a careful study of his eyes, and too much importance cannot well be attached to the necessity of a good disposition. In every case take a bill of the horse, written by the seller himself, with the horse described therein as sound or unsound. If a buyer is personally acquainted with any reliable person who has a satisfactory horse for sale, it is better to purchase of him, even though it may cost more. Nearly every man feels indignant at the suggestion that he is not competent to handle any horse, while the fact is this: "That after you and I are taken out of the list, there remains comparatively few men really competent to handle a fine, high-strung, nervous horse, although it may not be in the least vicious." Many a man has made a serious mistake by getting more horseflesh than he can handle. He may lack the patience required with a wide-awke horse. —*American Agriculturist for July.*

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COMPLETE CONSUMPTION OF COAL.

We learn from German sources that the process known as the "automatic and smokeless consumption of powdered coal" has been tried to some extent in various quarters, and even adopted by the Vulcan Forges at Stettin. *Kuhlow's* gives the following account of the *modus operandi*:—

"The process is a simple one; the fuel, instead of being introduced into the fire box in the ordinary manner, is first reduced to powder by pulverisers of any construction. In the place of the ordinary boiler fire box, there is a combustion chamber in the form of a closed furnace lined with firebrick, and provided with an injector similar in construction to those used in oil-burning furnaces. This chamber has two openings; one on the center line and in the place of the usual furnace fire door, and the other on the opposite side. The orifice of the nozzle is placed in the latter aperture, and throws a constant stream of fuel into the chamber. This nozzle is so located that it scatters the powder throughout the whole space of the fire box. When this powder is once ignited, which is very readily done by first raising the lining to a high temperature by an ogen fire, the combustion continues in an intense and regular manner under the action of the current of air which carries it in. This current is regulated once for all by the amount of powder required for the production of the heat led off to the boiler and the evaporation of the weight of steam demanded.

"The powder is stored in a box, whence, by means of an ingenious arrangement, the air under pressure carries it to the fire box. Numerous applications and experience have, according to continental journals, established this practice on the South-Eastern Railway of Russia and the steam vessels of the Caspian Sea.

"In the system under consideration the coal, so that it may be drawn out and carried along by the steam or air under pressure, needs to be finely pulverised, and that explains how it is that such success has been attained in the use of coal which was already finely divided.

"The air and fuel are therefore intimately mingled in the furnace. It is urged that in this process the combustion of the fuel is complete, for each particle of coal in suspension in the fire box is in contact with the oxygen required for its consumption, which is thus proved to be a state of affairs far less difficult of attainment than was hitherto considered.

"It is also explained that the air entering the combustion chamber may be first heated to a high temperature by utilising the heat of the escaping gases in the stack. This air may also be mingled with a jet of steam, which decomposes into hydrogen and oxygen, the hydrogen serving by its combustion to assist in the elevation of the fire box temperatures. By this system the admission of cold air is avoided and a constant temperature can be obtained. It appears that in case of accident the fire can be instantly extinguished by actuating the valve which cuts off the supply of fuel. High chimneys are no longer a necessity, as the fire box is operated under a sort of forced draught."—*Manchester Sugar Cane.*

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THE VEDALIA CARDINALIS.

One of the greatest charms of Archibald Clavering Gunter's works of fiction is his apt similes. This modern (and great) American writer knows how to see things, draw conclusions and make comparisons. In his latest book, Baron Montez, where he wishes to picture the greed and avarice of the Baron who wished to devour, financially, everything connected with the Panama canal scheme, he compares him to the little Australian lady bird, the small insect that has saved the California orange growers from destruction by the scale. Mr. Gunter writes of this little insect as follows:

Far away Australia, among other wondrous birds, beasts, fishes and reptiles, has given birth to a most marvelous insect, the Vadalia Cardinalis. Its appetite is phenomenal, its voracity beyond description. Though not destructive to vegetable life, were it large enough it would eat the entire animal world.

There is also a lazy lower order of insect that lives dreamily upon the orange trees of California, known by the name of cottony scale. Its form of life is so low that it seems more a white incrustation on the beautiful plants than an insect which lives upon their leaves and life.

Into the orange orchard, dying from myriads of cottony scale, the planter lets loose a few vadalia cardinalis. These prey upon and eat up the lazy white cottony scale with incredible rapidity, and the beautiful plants, bereft of what is drawing their life away, survive and flourish. But after the vadalia cardinalis have eaten up all the cottony scale insects in the orange plantation, with incredible voracity they fall upon and devour each other, and the survivors again devour. Each hour they become fewer and fewer until there are but two vadalia cardinalis left. And these two battle and fight with each other until one is victorious and destroys and devours his opponent. And from that orchard that once was white with cottony scale glistening in the tropical sun, and here and there a spot of vadalia candinalis, but one insect crawls away seeking for further prey for his all devouring jaws—one vadalia cardinalis.—*Florida Agriculturist.*

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CANE CUTTING WITH WHITE LABOR IN QUEENSLAND.

The undersigned, contractors cutting cane near Homebush, seeing a number of statements in the *Mercury* of yesterday, alleged to have been made by Henry Hampton, with reference to the manner in which the contractors have done their work, the wages they can earn, and the manner in which they spend their money, beg to lay before your readers a true statement of the case. The number of men composing the gang is 25, but of these only about 20 are engaged in the actual cutting and loading of the cane, as the contractors have to "cut, load, and deliver on the main tram line." Thus, it is usual to have 2 men driving, 2 men plate laying, and 1 cook, out of the 25.

For the last six weeks the amount earned by us was £3 17s. 6d. per man, which is 12s. 11d. per week, after paying for our food. We were working the whole time, though the cane, generally speaking, was not quite so good as what we expect to have to cut. The price per ton during the six weeks referred to was 2s. 6d. for plant cane and 2s. 9d. for ratoons, rates at which it will be seen that we have not been able to earn large wages. Hampton refers to working men being too fond of the public house, a remark which we think comes from him with an ill grace, considering that the police court records of last week show that he, since he left his former mates, was discharged with a caution for drunkenness. We remain, etc.

K. G. Brown,
H. Rowles,
James Calloway.

—*Mackay Standard, Aug. 11, 1893.*

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SHALL WE GROW TOBACCO?

A paper was read the other day before a commercial body in this city on the profits of tobacco-raising in this State. It was stated that in Santa Clara County a fair tobacco can be grown at a cost of about $50 an acre, and that the crop would average 1000 pounds an acre worth 25 cents a pound, thus yielding a profit of $200 an acre to the grower; more than he could make in an average of years by raising fruit. Ranchers were urged to cultivate the tobacco plant.

There is probably some exaggeration in the figures. A thousand pounds of merchantable tobacco free of stalks is a large yield. And there are many kinds of tobacco which vary in value. The Connecticut and Ohio product will not compare with the Virginia and Kentucky leaf, and the Canadian tobacco is a still lower grade and is unsaleable out of the province. The really fine tobacco which is used by chewers and pipe-smokers is only made at Richmond, where the art of sweetening the leaf with liquorice has been brought to high perfection. The tobacco of Connecticut, which is also raised in small quantities in other Northern States, is consumed in the factories which make cheap cigars, worth at wholesale about $2 a thousand. We used to make a good many of these cigars in this State. Of late years from various causes the production has fallen off, though the home market is still mainly supplied by home production. When the industry was active, eight or ten years ago, we imported the leaf from New York or Connecticut and sold the finished product as far east as Texas.

If there be a principle in agriculture which ought to be understood it is that no farmer can afford to grow tobacco who cannot afford to fertilize his land. In the seventeenth century two of the colonies grew little else but tobacco. These were Virginia and Maryland. It was almost their only export, the support of their governments, their sole currency. Just as in this State forty years ago the value of commodities was reckoned by the ounce of gold, so in Williamsburg and Jamestown, Va., and throughout Maryland from 1620 to 1700 merchandise was appraised at so many pounds of tobacco. A dinner or a bed cost so many pounds; a malefactor was sentenced to pay a fine in tobacco. The consequence of this extensive cultivation of the tobacco-plant was the exhaustion of the most fertile valleys of Virginia—an exhaustion from which they have not yet recovered. In that colony the impoverished planters abandoned their plantations and migrated across the mountains to settle the Shenandoah Valley and East Tennessee and Kentucky, taking care, in their new homes, to devote a larger portion of their soil to raising food products than was allowed for the tobacco field. In Maryland at one time tobacco-raising was abandoned and wheat-planting substituted.

Tobacco, however, was a crop which was easily raised with slave labor, and after the establishment of independence, it again became the staple crop of all the border States. It is not too much to say that it has kept them poor ever since.

The tobacco plant draws the nitrogen out of the soil, and in our day each crop leaves the field on which it was grown absolutely dead, incapable of growing tobacco or anything else. The Virginians and Kentuckians repair the damage by the use of the artificial manures, specially manufactured to meet the case, but the manure costs nearly as much as the crop is worth. When the tobacco-planter sells his crop and puts the money in his pocket, and buys the fertilizer required for next year, he has nothing but a little small change left. There is no finer country in the world than the river bottoms of Virginia; they are a perfect paradise; but the soil has been so ruined by the alternation of exhaustive tobacco crops and the artificial stimulus of chemical manures that a plantation will not sell at any price.

On the opposition side of the tobacco-growing proposition it may be argued a more scientific treatment of the soil may arrest impoverishment. Wheat, if grown steadily, exhausts the richest soil in a few years, and yet the use of proper fertilizers enables the wheat-grower to produce an average of about twenty-eight bushels to the acre. If tobacco will pay a profit of one-half of $200 an acre the cost of fertilizing would not eat up the profit.—*S. F. Call.*

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THRIVING ON HEMP.

The Bahama Islands, which should geographically belong to the United States, but which are held by Great Britain as a valued possession, have been rising in commercial importance of late through the cultivation of a species of hemp called heneguen or sisal, which finds a ready sale. Wherever there is soil in this group of little islands and rocks sisal thrives, and it is destined to take the trade place of many of the fruits which for numbers of years have formed the chief export to New York. Sponges, sisal and turtle will become the staples of Bahama trade. According to the Governor of the group, Sir Ambrose Shea, there are now 20,000 acres under cultivation. Perhaps 600,000 acres of the total area is adapted to the growth of this plant, but the Government is limiting the sales of land in order to prevent monopolizing grabbers getting hold of it. Of 100,000 acres which there is permission to sell within ten years, over 60,000 acres are in the hands of purchasers. Nearly all the capital put into the enterprise is thus far British, but there are no checks upon aliens acquiring property. Mr. Joseph Chamberlain, the statesman, who was supposed to have most of his investments in the screw-making industry, is one of the principal owners, and is represented by a son. Labor it seems is abundant at 50 cents a day for men. As far as soil goes the adjoining State of Florida ought to answer equally well for the production of raw material. Probably it requires a good deal of moisture, and if that be the case this condition would render it unsuitable for California. In the Bahamas the annual rainfall varies from forty-three to forty-five inches.—*S. F. Call.*

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DON'TS FOR ENGINEERS.

A contemporary gives the following concise bits of advice to those having charge of steam boilers:

Don't expect too much of a steam boiler.

Don't overwork it, for overwork has a bad effect on a boiler.

Don't neglect it, for a boiler can't be expected to keep itself in good condition.

Don't overheat it, for a boiler is very sensitive to extreme heat.

Don't cool it suddenly, for a boiler has a way of resenting such treatment that is apt to be expensive to you.

Don't let it leak, for leaks and explosions are sometimes spoken of in the same breath.

Don't work it when out of order, for a partly disabled boiler is likely to become permanently so if kept under steam.

Don't neglect making necessary repairs to your boiler, for delay means danger in such cases.

Don't let an inexperienced man fire it, for a boiler will show by the way it performs its duty that it knows the difference.

Don't open the furnace doors unless it is necessary, for every time you do it the cold air rushes in and lowers the temperature, and retards the work of steam-making.