THE HAWAIIAN

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An ordinance imposing a heavy penalty against coachmen turning their vehicles in the street without first taking the precaution to see if there is a bicycle in the way, says an *Exchange*, would be much appreciated. Accidents from this cause are of frequent occurrence and often times very disastrous.

Elwood Cooper, of Santa Barbara, Cal., obtained a gold medal at the Atlanta Exposition for Cooper's olive oil. California won in all five gold medals. The California exhibits also won twenty-seven silver medals, twenty-eight bronze medals, fourteen honorable mentions, making seventy-five premiums in all.

Ask any statesman in any country what has been the effect of the saloon upon the life of the nation, and he will tell you that it rots away and eats into the very vitals of the people. This is shown by the scientific reports compiled on the subject in Paris. Besides, I think we ought to have some consideration for the devil. He ought to have a rest on Sunday, for he certainly works hard enough the other six days in the week.—*Frederic R. Coudert.*

The importance of angle worms in agriculture has been demonstrated by Professor Wollny, of Munich. Peas, beans, potatoes and other vegetables were grown in wooden boxes, with and without worms, and in every case the presence of worms gave an increase of crop, varying from 25 per cent. in the peas to 94 per cent. in the rye.

The total number of trade failures throughout the United States in 1895 was 13,013 as compared with 12,721 in 1894, an increase of 2.2 per cent. This is the largest record of failures ever reported since the record was begun, with the single exception of the panic year of 1893. The amount involved in these failures was $158,842,445.

There are several sugar refineries in Chili; one located at Vina del-Mar, about six miles from Santiago, which turns out from 12,000 to 15,000 tons of refined sugar annually, and another at Penco, in Talcahuano Bay, which turns out about a third of this quantity. The raw sugar used for refining is exclusively cane sugar, part from Peru, the rest from Java.

With the first of January the people of Detroit began to enjoy the fruits of their six months' struggle with the street railway corporations, and now have the distinction of being the only people in the United States who enjoy the economy of three-cent street railway fares. The city ordinance provides that the street railway company shall sell eight tickets for twenty-five cents.

America has broken the record with a "mammoth" potato, which is 28 inches long, 14 inches in diameter, and weighs 86 lb. 10 oz. This is equivalent in weight to over a bushel of ordinary potatoes. It was grown by Mr. J. B. Swan, of Loveland, Colorado, who raised 430 bushels of potatoes on a single acre last season. The mammoth potato is to be used for seed, it being "too big to eat."—*Ex.*

It is stated in a California paper that Col. Crocker is making the experiment of raising coffee in the San Joaquin valley, and for this purpose has imported one thousand plants of the Liberian variety from Central America. The colonel deserves praise for his enterprise, and it is possible that the trees may thrive in some of the warmer vallies, but whether they will produce mature berries remains to be seen. The variety selected is the best for this purpose, but as some other varieties do well at an elevation of 4,000 feet, better than the Liberian, it may be well to obtain some of them also for experiment.

NEW STEAMER TIME-TABLE.—The editor of this periodical has prepared a new schedule, called the "Tourists' Guide Steamer Time-Table," which, in addition to the usual information regarding the time of arrival and departure from Honolulu, gives the date when each steamer of the 84 vessels on the list leaves San Francisco, Vancouver, Sydney or Yokohama for this port—a feature that has never before been attempted, owing to the frequent changes in dates of departure. This schedule will prove valuable to correspondents living in America, as they can by it time their letters to catch the steamer mails. Each subscriber to the PLANTER will receive a copy accompanying the February date.

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LATEST SUGAR QUOTATIONS.

From Messrs. Castle & Cooke's circular, dated Honolulu, February 14th, we quote the following transactions reported by the SS. "Mariposa," bringing San Francisco advices to the 7th inst.:

CENTRIFUGALS have remained at 3⅜ for 96°, the following sales having been made: January 28th, 12,000 bags spot; January 31st, 4,000 bags spot; February 3rd, 20,000 bags spot; February 4th, 3,000 bags spot; February 6th, 550 tons to arrive; all at 3⅜ cents for 96°.

GRANULATED is 4.69 cents in New York, and in San Francisco it is 4⅞ cents nett.

BEETS. Prices have taken a further advance and close very firm; we give you below the quotations as received:

Jan. 28th...11s. 7½d. Jan.-Feb.—Feb. 1st...11s. 9d. Mar....11s. 10½.
Jan. 30th ..11s. 10½d. Jan.-Feb.—Feb. 6th...11s. 10½d.

SUGAR STOCK has also taken a further advance and closed with a strong upward tendency; following are the closing quotations on dates given:

	COMMON.	PREFER.
Feb. 1st	$ 107	$ 98¾
" 3rd	106½	98¾
" 4th	107⅞	99½
" 5th	109½	99¾
" 6th	110⅞	100

TARIFF.—Nothing further has been done in Congress in regard to this.

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COMMITTEES OF THE HAWAIIAN SUGAR PLANTERS' ASSOCIATION FOR 1896.

LABOR.—Mr. C. Bolte, Chairman; Messrs. E D. Tenney and J. F. Hackfeld.

FERTILIZATION.—Dr. W. Maxwell, Chairman; Messrs. G. F. Renton, C. C. Kennedy, H. Morrison, D. Center and E. K. Bull.

CULTIVATION.—Dr. W. Maxwell, Chairman; Messrs. A. Lidgate, C. Wolters, J. W. Colville and A. Ahrens.

MANUFACTURE.—Dr. W. Maxwell, Chairman; Messrs. W. W. Goodale, A. Cropp, C. B. Wells and W. J. Lowrie.

MACHINERY.—Mr. A. Young, Chairman; Messrs. A. Moore, G. R. Ewart, John Hind and Geo. Ross.

FORESTRY.—Mr. W. M. Giffard, Chairman; Messrs. H. P. Baldwin, D. Forbes, J. A. Scott, C. M. Walton and G. N. Wilcox.

SICKNESS AND INSECT ENEMIES OF CANE.—Mr. J. Marsden, Chairman; Messrs. G. Chalmers, Otto Isenberg, W. von Gravemeyer and J. Watt.

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SILK CULTURE.

A correspondent desires information regarding silk worms, and asks the following queries:

1. "How many worms must one keep to make anything like a paying concern?"
2. "What is the best book on silk culture?"
3. "What chances are there of a market for raw silk?"
4. "Can cocoons be transported without the silk being reeled off (of course having been previously killed)?"

To answer these questions properly requires the experience of a person who has been engaged in this industry, either here or elsewhere. Should these lines reach the eye of any such person who can answer them, we shall be glad to hear from him. Some fifty years ago, Mr. Charles Titcomb established a silk farm at Hanalei on Kauai, and succeeded in producing fine merchantable raw silk. The business was abandoned, however, and the grove of mulberry trees, the leaves of which furnish food for the silk worms, gave way to coffee trees, which produced large crops of this berry, until the deadly blight destroyed them. Mulberry trees grow well on these islands, and so far as we know, have no enemies.

Silk culture is an industry in which women are largely engaged in France and Italy, and there seems to be no reason why it may not furnish them occupation here, where the climate is so mild, and the work is mostly done under cover.

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HAWAII AND AMERICA.

"Will our friend of the PLANTER explain how it is that if Mr. Cleveland is the good and true friend of the Republic of Hawaii he represents him to be, why he says that no one expects a permanent ratification of the existing or closer bonds of union from the present administration at Washington."—*Com'l Record, Jan. 28.*

The PLANTER did not refer to President Cleveland as the "good and true friend of the Republic of Hawaii," or even intimate that he favored annexation. On the contrary, he has never, that we are aware of, expressed himself in favor of the annexation of Hawaii to the United States, and is generally believed to be opposed to it, as are many worthy American statesmen. This is why no one here or in the United States expects annexation during his term of office. We referred only to an act of kindness toward Hawaii performed by him in 1886, and he surely deserves credit for it. Every true Hawaiian is grateful to him for the interest that he took in the renewal of the reciprocity treaty, which has increased so greatly the prosperity of Hawaii, and brought it into closer harmony with the American commercial and political system to which it unquestionably belongs, and of which it should become a part.

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EUROPEAN SUGAR BOUNTIES.

The rivalry between the European governments is forcing the sugar bounty up to a point, which will result in a disaster either to the governments or to the sugar interests. A

New York paper, commenting on the situation, says: "Solely under the influence of subsidies the acreage of sugar beets in eleven years increased 36 per cent; and omitting Russia the increase was very much greater than that. Sugar has been overproduced, and the price consequently declined, and the result is a reduction of thirteen per cent. in the acreage. Each nation involved in this ridiculous competition is making sugar dear to its own citizens by a high consumption tax and cheap to foreigners by a bounty to exports. The German Government, for example, is compelling its own citizens to pay money to the exporters so that they can sell sugar cheap in foreign countries. In this struggle, to maintain sugar exports, the victory must be with the nation that can pay the largest bounty, and if the competition be kept up, each nation must give sugar away, or even go beyond that, and throw in a chromo with each pound of sugar. The German Government would like to get out of the scrape, but if it abandons its bounties, while others maintain theirs, it will simply give its export trade away to its rivals. There has been brought forward a bill in the German parliament provisionally increasing the bounty from $1\frac{1}{4}$ to 4 marks, in order to kill the export trade of Austria and France, unless they will come to an agreement to abandon, or greatly reduce, the scale of bounties. It is in effect a "cut rate" to be used to compel the independent producers to come into an international combine. But some of the German papers wish to know where the four marks are to come from, and if they are to be raised by additional taxation on sugar consumed at home, they wish to know if the home consumption will not decrease while the exportation is increasing."

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DEEP AND THOROUGH PLOWING.

We have received from the Agricultural Experiment Station of Nebraska, copy of a recent bulletin, illustrating by photograph views the advantage of deep plowing in corn culture. The contrast is very great, so much as to remove all doubt that in dry places or in droughts it will sometimes secure largely increased crops. It shows that the entire art of raising crops suited to the temperature of a locality consists in having the necessary constituents in the soil, with a water supply sufficient to dissolve them and convey them to the plant. A soil whose mechanical condition is such that water falling upon it will sink instead of running off will retain more moisture than one which drains off along the surface of the subsoil, and if, then, during the growing season evaporation is prevented by perfect tilth, all has been done that can be done by the farmer. A porous gravelly subsoil, of course, needs no subsoiling. Land once subsoiled will remain more or less loose for two or three seasons, when it will need subsoiling again.

The bulletin says: "The success of the sugar beet crop during the dry season has been very noticeable. The fact that the land is nearly always subsoiled for this crop has, without doubt, much to do with this success. Although the deep stirring of the soil for beets was intended to allow the root to penetrate easily into the toil, and thus secure a beet of a form well suited to store up sugar, yet experiments have repeatedly shown that healthier plants and larger yields of roots per acre as well as beets of better quality are obtained where subsoiling is practiced. Sugar beet culture has thus been incidentally a great boon to agriculture in Nebraska by demonstrating the advantages to be derived from subsoiling."

Practice that is good for sugar beets in dry localities, is equally good for sugar cane.

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QUEENSLAND SUGAR REVIEW.

From a recent issue of the *Mackay Standard*, we clip the following from its annual review of the sugar interest in Queensland in 1895: "Owing to a prolonged drought the prospects for the coming season are not quite as bright as we might wish them to be, but, as we pointed out recently, there are good hopes of an agricultural recovery, and the weather during the last week or two gives us reason to think that our hopes may be very likely realized. We cannot boast a crop equal to that to which we alluded at this time last year, but nevertheless we shall not find, when the returns are all in, that the output has been a very unsatisfactory one. The worst feature of the year is the fact that owing to circumstances, over which we here are unable to exercise any control, prices for our product have been so low as to permit of a very small margin of profit, but it remains to be seen whether the co-operative central mills will not be able to exhibit, even at the low market prices a profit such as will give encouragement for the future, for we do not hesitate to affirm that we have during the last year touched the very bedrock of low prices. The expansion which has taken place in connection with our industry has been during the past year most satisfactory. Two new mills have been opened under the Sugar Works Guarantee Act at Marian and Pleystowe, and though there are those who declare that too many mills are now available, we hold to the opinion that it is by reason of the competition between the growers and the manufacturers that we may look forward to a continuation of that expansion of the industry which will, in the course of a few years, render this district the most important agricultural centre in Queensland. The very fact of our being to some extent over milled at the present time will inevitably lead to the mills competing for a larger supply of cane, and the growers will beyond any doubt respond to the high prices by extending their plantings, and therefore we may anticipate that the time is not far distant when we shall find the position reversed, and the growers will discover that they have a larger supply of cane than the mills can take off conveniently."

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THE SUGAR MARKET.

The following remarks on the condition of the world's sugar market are taken from James Dunn's Glasgow review for the year ending December, 1895:

"The estimates of production available for 1895-96, as given by Mr. Licht, are 2,540,000 tons of cane sugar and 4,130,000 tons of beetroot. In the former case there is thus an estimated decrease of 525,000 tons, and in the latter of 675,000 tons, as compared with the crop of 1894-95. In an estimate, confined to beetroot, made by Mr. Gieseker, the Belgian authority, he calculated the deficiency at 1,000,000 tons, but, as matters have since shaped, Mr. Licht's estimate appears to be much nearer the mark. In these estimates there is a complete reversal of what took place last year, when a surplus of more than 800,000 tons over the crop of 1893-94 had to be faced, and which produced, as has been seen, such disastrous consequences to values. The change in the position stands for the moment discounted by an advance of say 2s per cwt. on 88 per cent. beetroot and 2s 1½d per cwt. on first marks granulated from the lowest points of the year. The matter of production, which of course from the very nature of things, must ever remain a dominant factor in the regulution of all values, becomes more than ordinarily so in the case of sugar, because of the unnatural conditions which apply to its cultivation in European countries. Protected and fostered, as it has been by export bounties, etc., the quantity produced has periodically so greatly overlapped requirements, that this danger may be said to stand before the trade as a permanent menace. This is especially the case in an age, and in relation to an article, which necessitates so much anticipatory action.

Beginning with the crop of 1885-6, the production was 4,500,000 tons. It was increased 500,000 tons in the following year, and this increase was maintained down to, and including, the campaign of 1888-89. In that of 1889-90, a further addition of over 700,000 tons was made, and there it rested till 1892-93, when almost 900,000 tons were added to the yearly supply. In the following year an equal addition again took place, but only to be followed by one of 800,000 tons in 1894-95. At this point, the position was, as it were, put under repair by the area of cultivation for the crop of 1895-96 being so reduced as to bring back the supply to something like what the crop of 1893-94 produced, which was in the neighborhood of 6,700,000 tons. The effect of this cutting down will mean a reduction of somewhere about 1,000,000 tons from the production of 1894-95. The relations existing between the correlative elements of supply and demand, under present conditions, bear a striking resemblance to the case of the door and its framework which were constantly a variance. This inconvenient state of affairs, as was ultimately discovered, arose from the energy derived from the hidden life of a fungus whose insidious growth underneath the threshold had, by creating ever-varying forms of displacement, made the periodical application of the carpenter's plane no more than a temporary remedy. It is now reported, in this regard, that a proposal may be brought before the German Reichstag to raise the inland duty on beetroot by about 33 per cent., and to treble the bounties on the export of refined; but, such action being yet by no means certain, it need not, meanwhile, be further referred to.

"The question of consumption becomes year by year a more and more difficult one to treat of with anything approaching decent accuracy. The progress which has been made in this respect, and the consequent diversion of shipments into new channels, have been such that it has become almost as difficult to reckon with the fresh sources of demand, as it long has been with reference to those which furnish the supply. And in this it is interesting to perceive that the one, the outcome of a system admitted unsound, has, in point of fact, become a helper towards the furtherance of a much desired end. So promising, indeed, is this feature of the business, that the danger of overlapping, in the case of production, may one day be changed into a pinch, and in the progress of development in this direction there lies a by no means distant prospect for more favorable times for the producer. It is under-consumption, rather than over-production, that in reality calls for first consideration."

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EXPERIMENTS WITH THE LIMING OF CANE JUICE.

EDITOR PLANTER'S MONTHLY.--In the report of the Committee on Manufacture, presented to the Planters' Labor and Supply Company in November last, there occurs a statement with regard to clarification of cane juice, to which I think too little importance has been attached. The statement I refer to is this: "It has been found best to lime the juice before it has been heated."

Nearly three years ago on the occasion of putting a large juice heater in the mill here, I found that when the juice was heated above a certain point before coming to the clarifiers, and before being limed; that proper clarification was difficult and almost impossible. The blanket formed was scant, and the juice continued muddy after standing twice the usual time in the precipitators. The skimmings and settlings were also hard to filter-press, and refused to form a hard cake. I at once made a change, adding the lime to the juice before it was passed through the heater, and have had no further trouble in this particular direction since.

On studying the matter in the laboratory, I found that 160 deg. Fahr. was approximately the critical temperature at which the change took place, also that it took less lime to bring about the same degree of neutrality when added to the cold juice than when added after it had been heated to this point. Having in view this latter fact I have determined the acidity and reducing sugars or glucose in a large number of samples of juice, before and after heating to 160 deg., and have found that there is no increase either of acidity or glucose ratio, on heating juice from sound cane to this point.

Not finding the cause of the change here, I turned my attention to the effect of heating the raw unlimed juice on the nitrogen compounds contained therein, and have found in this, at least a partial explanation of the change referred to.

Anyone who knows even a little of vegetable physiology, need not be told that nearly all plants contain nitrogen in at least two distinct forms. The young growing plant, or the old one that has started a new growth by sending out shoots or suckers, holds its nitrogen chiefly in the form of amides, a form in which it is easily transported from one part to another of the growing plant. Plants which have reached maturity, hold their nitrogen chiefly in the form of albuminoids, as reserve material, which, when a new growth starts, is transformed into amides, to supply the growing parts.

A number of years ago, Von Lippmann* pointed out the presence of glutamine, an amide, in cane juice, and quite recently Dr. Maxwell carried on an extended investigation on the amides in Louisiana cane, and found asparagine, another amide, present in quite large quantity, especially in young suckers.

* Ber. Deutch. Chem. XV. 1156.

These amides not being coagulated by heat, as are the albuminoids, and forming soluble compounds or soluble decomposition products, with lime, are not removed in ordinary clarification. In view of this fact it occurred to me that possibly heat in the presence of the acid of the juice, transformed the albuminoids into amides, or some soluble compound; and as the coagulated albuminoids form the nucleus of the blanket which forms on the top of the clarifier; their partial removal or transformation was the cause of the difficulty.

During the past two years I have made a considerable number of determinations on the raw juice as follows: (1) Total nitrogen, (2) Albuminoids and Amides in cold juice, (3) Albuminoids and Amides in juice which has been heated to 160 deg. F., (4) Albuminoids and amides in juice which has been heated to boiling.

I give below two examples. Amides have been calculated as asparagine.

No. 1.—Brix. 17.3. Purity 91.0. Acidity in terms of decinormal alkali 10. Total nitrogen compounds 1.115 per cent. of solids in juice.

Cold juice:—

Albuminoids 95.5 per cent. of nitrogen compounds.
Amides 4.5 " " " " "

Juice heated to 160 deg.:—

Albuminoids 87.5 per cent. of nitrogen compounds.
Amides 12.5 " " " " "

Juice boiled one minute:—

Albuminoids 86.7 per cent. of nitrogen compounds.
Amides 13.3 " " " " "

No. 2.—Brix. 18.2. Purity 90.9. Acidity in terms of decinormal alkali 11.3. Total nitrogen compounds 1.032 per cent. of solids in juice.

Cold juice:—

Albuminoids 93.5 per cent. of nitrogen compounds.
Amides 6.5 " " " " "

Juice heated to 160 deg.:—

Albuminoids 81.4 per cent. of nitrogen compounds.
Amides 18.6 " " " " "

Juice boiled one minute:—

Albuminoids 77.4 per cent. of nitrogen compounds.
Amides 22.6 " " " " "

In the cold juice there were present no other nitrogen compounds, other than albuminoids and amides, but I am not prepared to say that the compound formed from the albuminoids on heating is an amide. It at least is not precipated by cupric hydrate, the reagent used in the laboratory, and as far as clarification is concerned, it behaves as an amide.

In every case the result has been the same; the albuminoids have notably diminished on heating, and the amides or soluble nitrogen compounds, have increased nearly in the ratio of 3 to 1.

This is as far as my investigation of this matter has gone, but I do not think that this is the only change brought about by heating the raw unlimed juice, chiefly for the reason that the nitrogen compounds form such a small part of the non-sugars in the juice. For example: on the day on which sample No. 2 was taken the total non-sugar in the juice for the day of eleven hours was 6931 pounds, and of this non-sugar, only 649 pounds were nitrogen compounds.

A point of importance to chemists has been brought out by the analyses, two of which I have given above. It has been customary in estimating albuminoids in cane juice, to heat the juice to boiling and then add the cupric hydrate to precipitate the albuminoids, but by so doing we determine *not* the albuminoids *actually* in the juice, but those remaining from the decomposing effects of heat and the acid of the juice.

As this method was used in making albuminoid determinations made under Dr. Maxwell's direction at the Louisiana Sugar Experimental Station, there is no doubt that the proportions of amides in Louisiana cane juice given by him are too high; although there is no question that in the immature cane there, amides are present in larger proportion than in the cane here.

EDMUND C. SHOREY,
Chemist Kohala Sugar Co.

Kohala, Feb. 4th, 1896,

MISLEADING STATEMENTS ABOUT PINEAPPLES

[CORRESPONDENCE FLORIDA AGRICULTURIST]

So many statements are made about the pineapple that a prospective grower is at a loss whose statements to believe, and what course to pursue. In the issue of the Florida AGRICULTURIST of December 25th, 1895, Mr. D. McLean, of Honolulu, would lead us to believe the Smooth Cayenne pineapple is the only kind worth having, and that nearly every other variety has been cast away there, and will soon be in Florida. "With fair treatment here" he says, "the Smooth Cayenne grows to ten and up to fourteen pounds."

These statements may be true in Honolulu, but they are misleading for a grove in Florida. For variety Florida can beat Honolulu out of sight if Mr. McLean is correct. Florida can raise successfully a very great variety; many of which stand shipping well. "With fair treatment here the Smooth Cayenne grows to ten and up to fourteen pounds weight." If ten and fourteen pound pineapples can be grown with "fair treatment," what monster pines those Honolulu growers might get if they would give their pines good treatment.

Now I believe such statements to be misleading. Mr. McLean writes as if it were an ordinary thing to raise acres of Smooth Cayenne weighing from ten to fourteen pounds. I have not been in Honolulu to see their methods of growing pines, but I greatly doubt if such results are obtainable generally, but may be in small patches under the best of care.

I am raising Smooth Cayenne on the Indian river, at Waveland, in the open field (not under cover as required at Orlando) weighing from five to nine pounds, actual weight, with good care. They packed on the average 24 to the barrel crate the season through. The largest packed 14 to the barrel crate. I think my results in the open field were fairly good and will be somewhat improved on, but not probably to the extent Mr. McLean speaks of.

In your last issue, that of January 1st, Mr. Geo. A. Wright, of Orlando, makes some very strong statements. He says "the Smooth Cayenne pineapple is the best shipper of all the varieties." Now I wonder if Mr. Wright made this statement because he knows it to be true from his experience in shipping "all the varieties" of pineapples, or because he too proposes to become an importer of the variety. Mr. Wright also says "the Smooth Cayenne stands more cold than all other varieties." I wonder if Mr. Wright knows that to be a fact also. If he does, and will adduce the facts to prove it to the satisfaction of old as well as prospective growers of pines, he will confer a great favor, and I shall be well paid for calling his attention to it.

Some of us have found the Smooth Cayenne to be a very tender variety, not standing the cold nearly as well as the Red Spanish or Abbachi or Porto Rico, even under similar circumstances in the open field. As to its good qualities as a shipper, very much depends upon the packing, as with all large pines. The Smooth Cayenne to go through well, and show up to advantage in the markets, must be very carefully packed, and as I believe this can be best done in half barrel crates with a middle partition. Certainly I believe all growers and shippers of any experience will give the palm to the Red Spanish as the best pineapple to carry well to market.

The Red Spanish will probably never be set aside as the best pineapple for shipping. All that Mr. McLean and Mr. Wright say about the productiveness, flavor and price on the market, I believe to be correct. My advice to all growers of pines, whether old or young, who intend to try a new variety to any extent, is to get their information from those who have been raising that variety and who have been through the failures as well as the successes. To all who have not tried it, beware of buying imported plants unless you cannot get home grown ones. They are generally small, dried up, and often mouldy and sour, and in the end very expensive.

There are lots of Smooth Cayenne plants to be obtained of native growth, right here in Florida in the very pink (or green) of condition, and much cheaper than St. Michael or Honolulu plants after the freights are paid on so long a haul.

CHAS. H. HOWLAND.

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The word "Boer," applied to the natives of the South African Republic, is Dutch for farmer, and akin to the German "bauer," and the English "boor," which meant originally a countryman.

SUGAR RETROSPECT FOR 1895.

[CONDENSED FROM THE MANCHESTER SUGAR CANE.]

The predominating impression derived from a retrospective consideration of the year now nearly completed, is that of the remarkable elasticity which characterises that great branch of the world's commerce connected with the production and distribution of sugar. In face of a combination of adverse circumstances sufficient to depress the energy and tax the utmost resources of those engaged, there has been a maintenance of activity, and even a buoyancy such as can only be considered as surprising. As the statistical position developed, and it became more and more certain that in Europe the larger area planted, and the greater cultural yield would result in a crop of beet sugar possibly amounting to nearly 5,000,000 tons, while the consumption showed no sign of attaining the normal rate of increase, a prospect for the near future was presented such as might well cause the boldest and most experienced to hesitate and lose heart. And yet on looking to the statistics of prices prevailing during this time of discouragement, we find that they have not only been well maintained, but that on no occasion has the extremely low level of 1894 been touched. This recuperative energy is one of the most hopeful characteristics of the year's trade, and is well calculated to encourage all concerned, for it can scarcely be said that any feature of an inspiriting nature—except perhaps the philosophy expressed in the old adage, "when things get to the worst they will begin to mend"—has been present in our markets during the twelve months under review. * * * *

Resuming our summary of the results of the past year we may just remark that the anticipation, expressed in our article on 1894 in the *Sugar Cane* of last January, with regard to the unlikelihood of the numerous projects for new factories in Germany and Austria being proceded with, have been fully verified, the majority of these having been definitely abandoned or held in abeyance. Our further anticipation respecting the probability of disastrous results has also been more than realised; the losses announced by the greater number of German factories are enormous, even after making full allowance for the probability of the balance sheets having in most cases been so adjusted as to show the maximum of loss, it being just now the role of the manufacturers to aggravate the difficulties of the situation, and present the darkest possible side of the picture.

Mauritius has been favored with a considerable diminution in the extent of the gum disease, from which it suffered so severely in 1894. We are not informed as yet to what this improvement is to be attributed, probably to more careful selection of the cane plants, but undoubtedly also to more favorable weather.

The West Indies are, however, still suffering from the borer, and the diminution in the yield was in many cases very marked. It is now satisfactorily demonstrated that every cause which tends to enfeeble the cane renders it more accessible to the attacks of the borer, while the borer holes also act as a medium for the introduction of fungus spores. This fully confirms the suspicion which we have always entertained and expressed that weakness is the primary factor in laying the cane open to the invasions of these formidable diseases and pests, from which it has lately suffered so much. The investigations of Professor Harrison in the island of St. Vincent (see pages 565 to 574 of our November number) appear decisive as to certain points on which varying opinions had hitherto been held, and it will be the fault of planters themselves if they much longer continue exposed to losses from these causes.

The Hawaiian Islands have been favored with a better season than had been anticipated, and as the agricultural prospects for the 1896 crop are described as good, the industry in this quarter must be regarded as flourishing, especially as regards the larger and better equipped estates.

Natal has suffered severely from locusts, and most energetic measures for their destruction have had to be adopted, and will probably have to be continued. In addition to the damage to the canes caused by this plague, the yield was further reduced by the late summer. In spite of these drawbacks, Natal may still dispute the palm with Queensland and Fiji as the pattern sugar-producing country in so far as profitable results are concerned.

In the Argentine Republic the production is rapidly overtaking the consumption, and for this reason, and the low prices of imported sugar, notwithstanding a heavy protective duty, the industry has not been so remunerative as heretofore. A proposition has been made that the Government should pay a premium on export, which will probably eventually be adopted.

Queensland is in an enviable state of prosperity as regards her cane growing industry, and though the low prices lately prevailing render it impossible to obtain the large profits of former years, planters and manufacturers are still in a satisfactory position. The growth of cane and the output of sugar are increasing, but the rift in the lute is supplied by the possibility that the production will soon exceed the consumption, and the surplus, after Mauritius sugar has been driven out of the Australian market, will have to compete with other sugars in the open market and perhaps be exported at a loss. It is earnestly hoped that no application for a bounty on export, which has already been hinted at, will be entertained by the Government. The state of the industry in New South Wales appears satisfactory, and as in the case of Mauritius we have not heard so many complaints of "gumming" during the past year. Experiments with beet-growing are being made, and an account of these will be found in our September number.

In the United States, with the exception of the unjustifiable interference of the Comptroller of the Treasury to prevent the payment of the bounty duly and legally voted by Congress, comparatively little of an exciting nature has taken place. The Louisiana crop was phenomenally large in 1894-95, the quantity of sugar produced having exceeded anything previously known there, but the yield obtained even with modern appliances seems small compared with that of tropical countries. Beet sugar production in California has considerably increased, and seems likely to undergo further extension, but has not been so successful in Nebraska. The American Sugar Refining Company, in spite of the starting of more than one independent refinery, has again successfully controlled the entire market in the United States, having hitherto been able to get the independent concerns to work in concert. An attempt is being made to rebel against the dictation of the so-called Trust, but this is probably doomed to failure. There is some talk of the probability of a repeal of the exta duty on certain sugars during the sitting of the present Congress. In the present state of American politics it is impossible to predict what may or may not happen. It may be noted that Henry Tate and Sons' refined sugars are finding some sale in the United States.

The Canadian beet sugar industry, though small, is extending, and prospects are good.

Java, although (as might be expected) very seriously affected by the low prices, is continuing to increase her production, the magnificent quality of her canes (the average yield of 1894 was calculated to be 10.36 per cent. on the weight of cane) and the exceptionally favorable climate enabling her to make head even against the present difficulties. The *sereh* disease has by no means disappeared, but the measures taken on the recommendation of the chemical experts at the experiment stations are enabling planters to steer clear of it, and to guard against recrudescence.

In Egypt, the past season was decidedly satisfactory from the cultural and manufacturing point of view, but the lower prices obtained naturally resulted in a diminished profit. The working of the Daira Sanieh sugar estates really leaves little to be desired. The success of diffusion at Cheikh Faddle must be considered as not yet full established.

In regard to India there is but little change to report, and, with perhaps the single exception of an increased import of beet sugar—most of what has been stated at some length in our May and October numbers is still fully applicable, and need not here be repeated.

There is a difficulty in giving details about Cuba, which, to one acquainted with its very special peculiarities, is quite explicable. The present interruption of communications, the chaotic state of some of the cane-growing districts, the monetary embarrassments and the fiscal vexations, the want of any capable government, the uncertainty as to the outcome of the situation, all combine with the unreliable nature of the telegraphic reports received from various quarters to render any just estimate of the situation of the island and its staple production an almost impossible task. * * * *

During the year the experiments with seedling canes have been continued in Demerara, Barbados, Queensland, Mauritius, Jamaica, and Louisiana. There appears reasonable ground to hope that before long more than one very rich variety of cane may be rendered stable, so as to be permanently available for regular planting, but it is now seen that the sanguine hopes of immediate success at first entertained were premature, and that nothing but continued painstaking experiments by competent and careful men can solve the problem.

Improvements in machinery and processes of manufacture have made considerable progress.

Clarification under high-pressure is a feature which has received special attention from one large Glasgow firm, D. Stewart and Co., Limited, and already a great advance has been made in securing a larger yield, but experiments are still going on, and the firm are confident of ultimately securing an ideal clarification.

Evaporation problems have been much discussed, and one new patent is said to produce extraordinary results, of which details are promised shortly.

Crystallisation in movement has also made progress, though the results asserted to be obtained have not met with complete acceptance.

A new process for extracting sugar from molasses by means of lead oxide has just lately been made public in Germany, and a patent has been applied for. Some details of this have appeared in our columns, and will be continued.

German sugar has this year been sent to Japan, owing tc the low prices prevailing and the large surplus weighing on the market. Java sugar continues to go to the United States in increasing quantities, the present shipments thither being at the rate of fully one-third of the quantity sent to Europe. * * * *

The position of the sugar industry in general cannot be regarded as satisfactory in any quarter, and it is, after all, a melancholy consideration to think of the enormous capability of extension of consumption in European countries, which would, if free course were given, for many years to come absorb all the sugar the world could produce, and yet is doomed to remain undeveloped in consequence of unsound fiscal arrangements, due to the exigencies of inflated armaments, created by infatuated international jealousy and mistrust, and by a long regime of mistaken and absurd political economy.

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NOTES ON COFFEE FROM LABORIE'S COFFEE PLANTER.

SITUATION.

Climate.—Coffee trees delight in the cold climate of the mountains, up to 4,500 feet, where the rain is abundant all the year round, alternating with bright sunshine. On the lower mountains, especially where they are subject to dry sea breezes, the berries will often be empty, mildewed, or scorched. and the tree short-lived.

Soil.—The best soil is a free, open virgin soil, four or five feet deep. On steep slopes the soil should be firm, but not clayey, mixed with a proportion of sand, gravel or small stones, through which water may easily pass. Even on white limestone, if the climate is rainy, coffee will flourish where the rocks are mixed with deep soil.

The indigenous vegetation is useful as a guide to richness of soil. As a rule, where the trees are large, high and numerous, and the underwood luxuriant, the soil is good, but the exceptions are mahogany, hardwoods and the cabbage palm, which may indicate poverty of soil.

It is important to have plenty of running water.

Aspect.—In low and hot places the best aspects are the north and west, because they are cooler. On the contrary, the east and south are the best in the highest situations. Strong winds are very injurious.

CULTIVATION.

Distance.—The quality and aspect of the ground ought to be the ruling guides to determine the distance of the trees from each other. The general rules are as follows:

(*a*) The richer the soil, the aspect being the same, the more distant must be the trees.

(*b*) The cooler the aspect, the quality of the soil being the same, the further asunder the trees must be planted.

(*c*) If on the north and west the ground is good, plant still farther. If, on the contrary, in the east or south it is light, plant still nearer. In both cases there is a double reason, namely, the quality and the aspect.

Accordingly, if to the south and east you plant at six feet, the quality of the ground being the same, plant at seven to the west and north, if the descent is steep; or at six by seven if it is easy, (the greater distance being between the rows) for where the descent is steep, the higher trees cast a longer shade upon those below.

(*d*) Where the wind blows strong it is an additional reason to plant at a still greater distance, because in that case the trees must be topped lower, and of course will spread out more in width.

[The distance at which coffee trees are planted in the mountains is 8 feet by 8, 7 feet by 7, or 6 feet by 6, but at lower elevations it may be 5 by 5, or even 4 by 4 feet].

Lining.—To mark off the ground for planting take a line of convenient length and divide it at the chosen distances of 6, 7 or 8 feet with small scraps of scarlet cloth.

Commence by getting two men to stretch the line along the ground at the top; drive in pegs 18 inches long at each spot marked by the scrap of scarlet.

Next move the line down to the distance determined on, either 6, 7 or 8 feet, measuring this distance by sticks of the proper length at both ends and in the middle. Put in pegs at the scarlet scraps, and so on through the whole ground.

Holes.—Holes should be dug at the pegs 9 to 12 inches in diameter, and 15 to 18 inches deep.

Nurseries.—Plants should be raised from seed in nurseries. The most level piece of the ground should be selected where the soil is crumbly. Make shallow trenches about 6 inches apart, put in the seeds about one inch from the other and lightly cover with soil. The seeds should be quite ripe and fresh and be taken out of the cherry. The nursery should have two oblique gutters made above it to carry off the rain.

It must be kept very clean of weeds, and no corn nor anything else grown in it. April is the best month for sowing.

Removal from Nursery.—When the seedlings are about a year old and have four little branches, they may be taken up to plant out. If possible, they should be dug up with a ball of earth so that the roots are not disturbed, and so planted in the holes. But if they have to be carried a long distance the balls of earth make them too heavy. In this case put a spade deep below the roots and raise the earth, take the seedling by the stem and carefully remove the earth. Cut about an inch off the tap-root, a little also off the other roots, [and about half off the leaves.] If the seedlings have to be kept before planting can be carried out, lay them in a shady place, cover the roots with moist earth and lay plantain leaves over all.

Planting.—The earth taken out of the hole and placed on the slope below it, is not to be returned to the hole, but the soil is scraped up from all round and put into the hole about four or five inches deep. Then the plant is taken with the left hand and placed in the hole as to just touch the soil at the bottom with the tap-root. With the right hand scrape up the soil round and fill into the hole to the depth of six inches, taking care that the roots are spread out in a natural position. Then lightly press down with both hands. Soil is again filled in and again pressed down more strongly, but with care that the plant be not hurt nor placed crooked. Three or four inches of the hole are left open, which will be filled in naturally as weeding goes on. The plant must be so placed that its two lower branches are rather below the level of the ground. The peg is to be placed at the upper edge of the hole as a fence against stones rolling down and as a mark if the plant should happen to die.

Shade during first year, etc.—In order to shade the young plants during the first year, corn should be sown beforehand in the middle between the rows and a row of beans on each side between the corn and the coffee. Plantains may be planted at the bottom sides of the roads at distances of six to eight feet apart, taking the place of the coffee at those spots. Sugar canes may be planted along the roadsides between. These will keep up the roads. The top sides of the road may be planted with cabbages, parsley, etc., but not with turnips, carrots or beets, which have to be dug out. No tobaccô should be allowed, as it seeds very freely and exhausts the ground. No ground provisions, yams, sweet potatoes, etc. should be planted, as they loosen the ground too much. (For permanent shade, see "Accidents, *e*").

Weeding.—Weeds take so much nourishment from the coffee that perhaps half the crop will be lost if the weeding is not attended to, and eventually the coffee tree dies. If the land is steep and the earth soft and crumbly weeding should be done by hand and not with the hoe. The weeds should be heaped up above the trees, between a tree and the one above it. The weeding should be done in good time so that the weeds are not allowed to seed. [Young coffee should be weeded every six or eight weeks. Prime coffee at least four times a year. It is a good plan especially with old and neglected coffee to cut grass and lay it on or thatch the surface of the ground, as it keeps down weeds, makes the soil cool and forms manure].

Accidents.—(*a*) If, in weeding, the young coffee trees are seen to be withered. the vacancies must be supplied with larger plants with balls of earth round their roots, planted in wider and deeper holes, adding some manure. [Nurseries of the smaller plants should be made in new fields for supplying the following year].

(*b*) If any plant is found broken or twisted, it must be cut close to the ground in a sloping direction, the cut surface facing the north. Suckers will shoot up from this, of which only the best should be preserved.

(*c*) When, after a light shower of rain towards noon, the sun comes out strong, the young plants may be blasted or the green berries mildewed. The only remedy is to plant afresh.

(*d*) Often and especially when the trees are eighteen or twenty months old, the leaves become yellow and withered. The cause may be a premature crop of berries. These should at once be stripped off entirely. If after a few days it does not begin to recover it is probably eaten at the roots by a large white grub. The tree must be taken up and the grub removed ; a larger hole should be made which should be left exposed to the sun for a fortnight and planted again.

(*e*) In hot situations banana and plantain trees are mixed with the coffee trees for the purpose of shade and coolness. These are usually placed at every fourth or sixth row, as the trees are more or less distant and the place more or less hot. If the bananas are placed in the intervals between the coffee they are too close and become entangled with their boughs, and the fall of the bunches and even of the leaves may break and hurt them. It is better, therefore, that a banana be placed instead of a coffee tree, and that the rows be alternately banana and coffee.

(*f*) If on the contrary, from the extreme coolness of the place the trees lose their leaves and the ends of the boughs wither, the situation must be examined. If the evil arises from the actual situation there is no other remedy but pruning freely, but this never happens except when trees are fully grown up. Sometimes, however, such accident arises from woodland or neighboring heights casting its shadow over the plantation. In such case nothing will answer but to clear away the wood.

(*g*) Where the climate is exceedingly cool and damp the trees grow well but do not bear, though the soil is good. This happens where the country is covered with wood, and the trees only become productive when the climate has been changed by cutting down the wood.

(*h*) Sometimes ants do mischief, and ashes may be spread at the foot of the tree to keep them off.

(*i*) When the season has been especially dry the berries are liable to be blasted, either empty, and though large and red, to have no seed in them, or mildewed (blackburnt) before they are ripe. There is no remedy. But this only rarely happens in the mountains.

Wind.—Strong winds are hurtful to coffee trees, affecting the leaves, flowers and berries ; and sometimes they so shake the trees that the trunk works a hole all round it, in which water becomes stagnant and causes the roots to rot. If this has happened the earth must be well broken up, the hole filled and the trees either propped or cut near the ground.

In such windy situations the trees should be planted at wider intervals and topped lower.

When a tree is propped the stake should be high enough to act as a good support, and the tree should be tied to it with the dry skin of the plantain.

The precaution may also be taken to plant shelter-belts of trees if it can be done without shading the coffee.

PRUNING.

Natural growth.—In order to understand the art of pruning the coffee tree it is necessary first to be well acquainted with the manner of its natural growth. Notice how the seedling bears its leaves, two on opposite sides of the stem, the second pair being on different sides from the first pair, and so on. When the young plant is twelve or fifteen inches high the first branches begin to make their appearance, each one in the eye just above the leaf. All these branches which spring from the main trunk are distinguished as *primaries.* The primary branches also bear leaves in the same manner opposite to one another in pairs; and from the eyes above these leaves other branches shoot out, which are known as *secondary* branches, and these in their turn again bear *tertiary* branches according to the same plan, and so on. Thus, all the branches grow in pairs, furnishing the tree all around without incumbrance, spreading out horizontally and with a direction in some measure towards the circumference. In the natural state no branches grow upwards or downwards nor more than one from the same leaf, but all in a regular and symmetrical manner.

If the tree is allowed to grow to its full height of fifteen or eighteen feet it will lose its lower branches, and bear the berries on the branches near the top of the tree.

Advantages of Topping.—For many reasons it is considered profitable to cut off the top of the tree whilst still young. It is an advantage to top it, because by doing so it loses none of the lowest branches, which are more productive than the topmost boughs; it is stronger and more vigorous both above and below ground; it is not so much exposed to damage by winds; there is no fear of breaking the branches in pulling them down to pick the berries—and this is important, for a primary branch never shoots again but is destroyed if broken.

Height.—The height at which trees should be topped varies; but it should never be greater than five feet in the most fertile soil and the best sheltered spot.

If the soil is not very fertile the tree may be topped at four feet, three feet or even two feet in very poor soil.

If the situation is exposed to wind, the trees should be topped lower than in well-sheltered spots.

When it has been decided to top at a certain height the point should be nipped off with the fingers while still green, when it has grown just beyond that height, taking care to remove it immediately below a knot where the leaves spring.

Opening or clearing.—Branches which grow straight up from under the primary branches (called *gormandisers*), or from the knots on the primaries (called riders) must be picked off with the fingers while still young and green.

If more than two buds appear at each knot, one above each leaf at opposite sides they should be picked off, leaving only the strongest which are growing outwards in the right direction.

Besides removing these, all of the secondary branches next to the trunk of the tree must be picked off, to allow the sun to penetrate and prevent the growth of moss.

If opening or clearing be well attended to there will be scarcely any need for pruning; and as more vigor is given to the bearing branches the crops will be larger. Opening should be attended to at every weeding, and any neglect made good after every crop. For instance, if any of the branches have been left that should have been picked whilst still green, they must now be cut off with a sharp knife.

If the head is spoiled it must be sawn off.

If a bough has been broken by accident and if any bough has become withered through bearing too many berries, they must be cut off.

Reproduction of boughs.—When a primary branch has been cut away as above, it is necessary to so manage that a new one shall take its place. This is done as follows: The primary branch should be cut off just above a knot where two secondary branches spring. Cut off one of these secondary branches just above the lowest leaf where a bud or a tertiary branch is appearing. This bud or tertiary branch will then lengthen out and take the place of the part of the primary branch that had been cut away.

Umbrella trees.—If opening or clearing has been neglected a mass of small branches is formed at the top, shutting off light from the lower boughs which consequently die and drop off. The tree becomes an "umbrella tree" bearing only a few berries near the top. The best means of dealing which such a tree is to cut it down close to the ground and allow a fresh sucker to spring up and form a new tree.

Necessity for full pruning.—Sometimes the tree looses its leaves, the end of the branches wither and scarcely any berries are produced. This is due to neglect of opening. and the only remedy is full pruning.

Half pruning.—Pruning consists in cutting off what does not agree with the natural shape of the tree, and preserving what corresponds with it. In warm situations and on good soil nothing is really necessary but opening, but if this has been neglected "half-pruning" must be employed.

First, whatever is rotten, withered or broken must be taken off, always remembering the method of "reproduction of boughs." Next, the gormandising, vertical and cross branches, as well as those which are too numerous and those which do not grow in natural directions must be plucked off or cut if too strong. If the head is rotten or spoiled it must be sawed off, but only just to where it is sound. The top and the center must be particularly laid open to admit the sun and air. Lastly, if the tree is still too thick, some secondary branches, those which diverge most from the natural direction must be taken out, for the primary boughs ought not to be touched.

Full Pruning.—Full pruning must never be employed except in cool situations. Trees which require the process are usually so thick and intricate, especially at the top, that the pruner is at a loss where and how to begin. The top must first be cleared by plucking all the small branches that abound in every direction. Next, crooked large branches as they are met with must be cut. Lastly, if the head is rotten it must be sawed, without sacrificing the least portion of what is sound.

The whole tree is then easily seen, and what is to be preserved or cut will not escape notice.

All the primary boughs which have kept their natural direction must be preserved for this reason, that once cut they never grow again. However, if they are entirely broken or spoiled at their rise, they must be cut off, or if they have taken a wrong or cross direction at their origin, they must be removed, if it is quite certain that they can be spared. If there is a single knot sound and well directed, and still more, if there are two or four, these must be preserved. If the farthest knot has a good secondary branch it must be treated as explained under "reproduction of boughs." If it has not, it must still be left, for it will bear several twigs, the best of which may be chosen, in the next operation, to make up the main bough. Thus all the boughs must be examined from above downwards, and treated as required.

Lastly, where the situation is exceedingly cool, and the trees are decayed into barreness, from the great overload of wood, all the boughs must be stripped of their secondary branches, both with a view to renew the fruit-bearing ones, and to give a stronger direction to the sap; as also, if the extremities of the boughs are withered, as happens in the trees stripped of their leaves, from severity of cold, or if they interfere with the neighboring trees, they must be pruned and shortened.

Feathering or Nipping.—A few days after the pruning has been performed, crowds of small twigs appear all over the wounded surfaces; and the excess must be removed, or the last state of the tree will be worse than the first, and it will be unable to support the luxuriance of growth. The nipping off the young growths must be guided by the knowledge of the natural shape of the tree. Thus, only two branches should be allowed at each knot; in all cases taking care to prefer such as have the most natural and horizontal direction. The knife should not be used now, but if any twigs have escaped notice which should have been removed, they can be cut off after 2 or 3 months, when they are 5 or 6 inches long.

Manure.—It is necessary to provide manure to help those trees that show signs of decay.

The dung of all kinds of animals, the sweepings of pens, houses, kitchen, poultry and pigeon houses; the leaves and trunks of banana and plantain trees; the weedings, and especially the pulp of coffee, should be collected in pits with puddled clay at bottom and sides. These pits should be protected against rain by some roofing, and against the wash of rain along the ground by making sloping gutters above. All this refuse is gradually changed into a black mould, which makes an excellent manure.

Decay of the Trees.—The decay of coffee trees may be *partial* from constitution, accident, or disease; or *general* from worn-out soil or the age of the trees.

The accidents to young trees have already been considered, and reference is now made to those of mature growth. Even when the soil is not yet exhausted, several trees may show signs of decay, and may require treatment according to different plans.

(a) The tree must be first well pruned, *half* or *full* pruning according to the state of decay. Next a trench must be dug all round, a foot or more wide, as deep as possible, and at the distance of a foot from the trunk. If any of the roots are found to be injured, they must be cut off; the others must be cleared and shortened with a sharp crooked knife. Then the pit must be filled again with the soil well broken up and mixed with a fourth or fifth part of well rotted manure. The surface is then to be beaten or trampled even and smooth. If the ground is very steep, some trunks of bananas should be laid down, and pegged, to prevent the ground from giving way.

(b) If the trees or branches are in a worse state than above, they may be sawn off near the ground, or near their point of origin, and when the shoots are advanced, the best and lowest in situation should be chosen and supported by a prop, the others being pulled off. The roots, too, must be dug round, pruned and manured, as above.

(c) If a tree is dead, another must be planted. The largest healthiest plant must be taken from the nursery with the ball of earth round its roots. A hole as big round as a flour-barrel must be dug, and the soil well broken up and manured; the young tree carefully planted, and its safety secured by trunks of bananas.

Tools.—The tools necessary ror pruning are a small hand-saw, about two inches broad at the handle; and a strong knife, at most an inch broad and five inches long, besides the hook which must be pointed. The blade ought to be of one piece with the handle, *Rules for use of tools.*—The saw should be used with one hand, while the trunk is held fast with the other. The trunk must be cut very sloping, with the cut facing north, so that sun and rain will injure it as little as possible.

If the boughs are too large to be cut with the knife, they must also be sawn, but it is better to bend down the bough gently and make a cut with the knife upwards with a quick even stroke.

As the saw tears and notches the bark round the edges of the cut, both wood and bark must be smoothed off with the knife.

In order to cut a branch, it must be gently bent, and held firm with one hand, and with the other the knife applied forwards, and drawn steadily and quickly.

The cut should always be made very close; thus, where a secondary branch is cut, let it be done very close to the mother bough: and if it is desirable to prevent the shoots from rising up in crowds, cut a little of the bark off the mother bough round the cut.

The knife and saw must be kept very sharp by means of the grindstone and triangular file.

CURING.

Coffee, properly cured, is perfectly dry, very hard and brittle if bitten with the teeth, of a fine deep green color, and a strong pleasing smell.

The berries should be as ripe as possible before being picked.

When once picked, it should not be left more than 24 hours before it is pulped, or the berry will turn brownish.

(After passing through the pulper the parchment coffee is left to ferment for 48 hours or more till the gum will wash off the parchment easily.) Water is then turned on into the tank, where it is thoroughly washed by turning and tossing it with a rake. The light seeds float on the surface, and should be removed and dried separately as *heading coffee.*

The skin rejected from the pulper makes excellent manure for the coffee trees, and should be kept for that purpose.

From the tank the parchment coffee is taken to a draining barbacue, spread out, and allowed to drain for an hour or two, then put on barbacues, and, if possible, put up that night in a hut.

When once the sun has shone on the parchment coffee, it must never be allowed to get wet with rain or dew.

As soon as rain threatens, and also every evening before the dew begins to fall, the coffee must be pushed by wooden shovers, or rakes, into barbacue huts.

Every morning, after the barbacues have been well swept and are warmed by the sun, the coffee is spread out again, and the drying process continues until it is perfectly dry and hard, and horn-green in color. When it is in this condition, it may be taken still warm from the sun into the coffee-store.

The parchment coffee will keep for 12 months, if necessary, in a dry store, until it is convenient to mill it.

When it is to be milled, sufficient coffee is taken out of the store, according to the capacity of the mill, and spread out very thin on a warm barbacue for 2 or 3 hours. It is then milled, winnowed, polished and sized, then placed on tables, and all black and broken beans picked out, which go as *triage*.

Coffee, properly cured, is worth 3d. or 4d. a pound more than if it is not well cured. Calculate how many pounds your crop weighs, and then how much money is lost by not curing it properly. For instance for every 100 pounds at least 25 shillings is lost, if the coffee is not properly cured.—*Jamaica Bulletin.*

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WATSONVILLE AND CHINO COMPARED.—The following is a statement of the number of tons of sugar produced annually by the Watsonville factory since 1888, and since 1891 by the Chino Valley Beet Sugar Co., whose mill is the second largest in this country:

Year.	Watsonville.	Chino.
1888	1,460	......
1889	1,585	......
1890	2,127	......
1891	2,170	973
1892	5,965	3,874
1893	7,760	7,532
1894	12,048	4,736
1895	10,845	10,300

ORGANIC SOLIDS NOT SUGARS IN CANE JUICE. PART I. NITROGENOUS SUBSTANCES.

BY DR. WALTER MAXWELL.

[Bulletin of Sugar Ex. Station, Audubon Park, Louisiana.]

It has been known that cane juice contains, in addition to cane and glucose sugars and mineral bodies, a very notable quantity of non-crystallizable organic substances which have been collectively described as "Organic Solids Not Sugars." The comparative amounts of those bodies present in the juice have been found to vary in the several kinds and with the differing degrees of development of cane. A part of those organic solids contain nitrogen, and that part has been understood as albuminous matters, or "albuminoids." The remaining portion, which is free from nitrogen, has generally been called, on account of the slimy and adhesive nature, "gums."

From cane juice moderately rich in cane sugar, but containing larger quantities of glucose and organic non-sugars, great difficulty has been experienced in recovering a reasonable yield of the cane sugar present, because of the action of the non-crystallizable organic bodies in preventing its crystallization. Whether it is the glucose or the organic solids not sugars, or both, which prevent the crystallization of the cane sugar is not in any degree clearly known. There are opinions, but few data, bearing upon this question. Until the nature and properties of all the organic substances contained in the juice are known it will not be possible to determine which are exerting the greater effect in holding back the cane sugar from crystallizing; nor shall we be able to devise effective modes of clarification and removal without, in the first place, understanding what are the bodies and impurities which we must remove.

In these investigations the organic solids not sugars are being considered in the two classes which have been mentioned.

I. Nitrogenous substances, or the so-called albuminoid bodies.

II. Non-nitrogenous matters, or all those substances which have usually been named "gums."

In the work conducted so far, consideration has been given almost exclusively to the nitrogenous matters contained in the juice, with only incidental allusion to the "gums," which also will be fully examined in their turn.

A very definite knowledge of the proportion of nitrogen contained in the cane and in the juice, has been afforded by general estimations, and especially by the determinations made by this Station of the nitrogen found in the cane in its several stages of development. In all these estimations, however, it has been assumed that the nitrogen was wholly present in the albuminous form, and the per cent. of nitrogen found was used to express the amount of albuminoids in the juice. In this work it has been attempted to ascertain if that assumption is correct; or whether the nitrogen present in the cane is in part found in the form of other chemical compounds. and not exclusively as albuminoids, which physiologically, would hardly be expected.

Moreover, because of the statements of several planters, who have had experience in working cane with the mill and also by diffusion, a comparative examination has been made of the solids not sugars contained in mill and diffusion juices. Great difficulty has been met in obtaining as good a clarification of diffusion juice as is usually made with mill juice, the trouble being that the impurities in the diffusion juice do not coagulate as completely and form a "blanket" which can be easily and fully removed. This peculiar behavior of diffusion juices in the clarifiers can be possibly due to the following causes:

Extraction by diffusion may take out of the cane certain impurities in excess of the proportion in which they are found in milled juice; or (especially by diffusion at high temperatures) other substances may be coagulated and left behind in the chips, and less of those substances will be contained in the diffusion juice than are found in normal mill juice; both of these causes may operate, however. Experience has indicated that the relative proportions of the several kinds of impurities in which they are contained in the normal mill juice are apparently those most favorable to the best clarification. Our investigations are attempting to learn if these indications of experience are altogether correct;

and if correct, to explain why they are; and also to suggest to practical sugar chemists and managers new methods of handling juices which are refractory in the clarifiers.

NITROGENOUS ORGANIC SUBSTANCES IN CANE JUICE.

We have said that the nitrogen found in the cane or juice, has hitherto been estimated as exclusively present in the form of albuminoids. The chemistry of plants, and of plant life, suggests to us that the nitrogen may also be present in some other organic forms, and that the relative proportions of albuminoids and other nitrogenous organic bodies contained in the juice will be regulated by the age and development of the cane.

This work was begun on the day of the commencement of the grinding season at the Experiment Station, and in order that it should be conducted with samples of juice obtained through the season from November to January inclusive, certain particular "runs" were made with the diffusion battery, and upon the "purple" and "striped" varieties of cane, and during those "runs" samples were taken as the juice left the battery; again, after leaving the clarifiers, and finally in the form of syrup. The small samples of juice taken every few minutes, for example, from the battery, were mixed together and the samples upon which these investigations were made were taken from the whole, and were strictly an average of the juice of the whole "run." The same mode of sampling was followed with clarified juices and syrups. The "runs" made in the Station sugar house, however, were short, and do not compare with the work of large factories. As it has already been said, corresponding samples of mill juice were taken from the chips before they entered the battery, and the results of the examination of the mill juice were made the basis and standard of comparison of the results obtained in the investigation of the diffusion and clarified juices, and of the syrups.

In the study of the milled juice, the object was to ascertain more definitely the nature of the organic nitrogenous substances present, and to determine whether the nitrogen was contained in other organic forms as well as albuminoids; and all this with a view of modifying our methods of clarifying, if the results should suggest any change.

The diffusion juice was examined side by side with the mill juice in order to see if it differed, and in what way, in its content of nitrogenous substances in comparison with the normal mill juice, and also to learn any cause why the diffusion juice should be more difficult to handle in the clarifiers.

The further study of the clarified juices and syrups was continued with the purpose of ascertaining more clearly the action of the chemical reagents, and of our common methods, used in clarification upon the nitrogenous bodies present in the juice.

In order that the results obtained with the mill, diffusion, and clarified juices and syrups be strictly comparative the proportions of nitrogen found must be estimated upon the basis of the total solids contained in each kind of juice, since the diffusion juice not only differs in density from the mill juice, but varies in itself according to the amount of dilution, which cannot be constant.

The first "run" upon both striped and purple canes were made in the second week of November The relative amounts of nitrogen (determined by the original Kjeldahl method) found in the mill and diffusion juices were:

Juice.	Striped. (Nitrogen.)	Purple. (Nitrogen.)
Mill (100 cc.)	0.03156 grams.	0.0322 grams.
Diffusion (100 cc.)	0.0350 grams.	0.0332 grams.

If these amounts of nitrogen were considered, as they have hitherto been, as albuminoid nitrogen, and the albuminoids calculated by multiplying with the factor 6. then the assumed per cent. of albuminoids contained in the juice, and the proportion of the total solids in the juice which are called albuminoids, would be as follows:

Juice.	Striped.		Purple.	
	Albuminoids in juice.	Albuminoids in total solids.	Albuminoids in juice.	Albuminoids in total solids.
Mill......	0.189 per cent.	1.26 per cent.	0.193 per cent.	1.34 per cent.
Diffusion.....	0.210 per cent.	1.40 per cent.	0.199 per cent	1.40 per cent.

The total solids in the juice of the striped cane were 15.0 per cent., and in the purple 14.4 per cents., (the diffusion juices are reduced to the density of mill juices in calculation.) From the table it is seen that the proportions of albuminoids in the juices of the purple and striped canes slightly varied, but when calculated to the total solids contained in the juices of the two varieties they were identical. The amounts of albuminoids found are slightly lower than those given by other chemists. This is chiefly owing to the circumstance that I have calculated the albuminoids from the nitrogen by multiplying with the factor 6, which is the mean between 5.75 and 6.25, and physiological chemists have found that the albuminoids vary in their content of nitrogen corresponding to the difference in those factors. It is thus safer to use the mean factor until the character of the cane albuminoids has been determined.

The table of results given pre-supposes that the nitrogen in the juice is all albuminous. An examination was made to see if the hitherto accepted suppositions were correct. This was done by determining the amount of nitrogen actually present in the juice as albuminoid nitrogen, and comparing this with the total nitrogen already found. The Stutzer method was used in estimating the albuminoid nitrogen as copper-albuminates, the factor 6 being adopted in the calculation.

The following table gives the results of the examination:

JUICE.	STRIPED.		PURPLE.	
	Total Nitrogen	Albuminoid Nitrogen.	Total Nitrogen.	Albuminoid, Nitrogen.
Mill (100 cc.) ...	0.03156 grams.	0.0112 grams.	0.0322 grams.	0.011046 grams.
Diffusion	0.0350 grams.	0.0081 grams.	0.0332 grams.	0.00836 grams

Before commenting upon these results it will be well to first convert them into a form which more clearly indicates their meaning. A further short table will do that for us:

JUICE.	STRIPED.		PURPLE.	
	Albuminoids in Juice.	Albuminoids in total solids.	Albuminoids in Juice.	Albuminoids in total solids.
Mill..........	0.063 per cent.	0.44 per cent.	0.066 per cent.	0.46 per cent.
Diffusion	0.040 per cent.	0.34 per cent.	0.050 per cent.	0.35 per cent.

The last table shows that the per cent. of albuminoids, in relation to the total solids, contained in the juice of the striped cane is 0.44 per cent., and in the purple 0.46 per cent.

Another table will now give the relative amounts of albuminoids, which latter the estimation of the albuminoids has shown to be present, in 100 parts of the nitrogenous matters present in the cane juice:

JUICE.	STRIPED.		PURPLE.	
	Albuminoids.	Non-albuminoids.	Albuminoids.	Non-albuminoids.
Mill	35.0 per cent.	65.0 per cent.	34 3 per cent.	65.7 per cent.
Diffusion	24.3 per cent.	75.7 per cent.	25.0 per cent.	75.0 per cent.

All the tables of results given show that the nitrogen present in the cane juice is not wholly in the form of albuminoids, and the last table indicates that only about one-third of the total nitrogen is albuminoids nitrogen, and that two-thirds of the nitrogen is present in chemical compounds of which, hitherto, no account has been taken. What those chemical compounds are will be considered later.

One very noteworthy feature expressed in the two last tables is the marked difference in the composition of the nitrogenous bodies contained in the mill and diffusion juices. It is shown that the nitrogenous matters in the mill juice are composed of one-third albuminoids and two-thirds non-albuminoids whilst the diffusion juice shows only one-fourth albuminoids and three-fourths non-albuminoids. These results lead us back to an introductory remark, viz.: "Diffusion may take out, particularly at high temperatures, more of some bodies and less of others than are found in the normal mill juice."

The results given in the previous tables were obtained by diffusion with cold water, no heat having been turned on the battery. To observe the action of a higher temperature in diffusion upon the nitrogenous bodies contained in the cane, a "run" was made with the battery kept uniformly at 150 deg. F. Several runs were also made at still higher temperatures, but the absence of uniformity of temperature in those makes it better to confine the comparison to the run made with cold water and the run at 150 deg. F. These two runs were made with purple cane, and on November 10th and 13th, respectively. The analyses were made in all examples with 100 cc. of juice and the calculations as already said are made in relation to the total solids in the juice, which in this table are 9.8 per cent.

NITROGEN.	RUN I.	RUN II.
	Cold diffusion.	Diffusion at 150 F.
Total nitrogen in 100 cc. juice	0.0226 grams.	0.03419 grams.
Albuminoid-nitrogen in 100 cc. juice	0.0057 grams.	0.00381 grams.
Albuminoid in total solids	0.45 per cent.	0.23 per cent.

In this table it is shown that diffusion at 150 deg. F. brought out of the cane almost double the amount of nitrogen found in the cold water diffusion juice. It is further shown, and this result is very noteworthy, that the proportion of albuminoids brought out by the cold water diffusion is nearly double the proportion extracted with hot water. We have here the most striking proof that diffusion at high temperatures brings out more nitrogen than diffusion at low temperature, and than milling does. Also high temperature causes the battery to hold back a large part of the albuminoids in the cane, and to extract a great excess of those nitrogenous bodies which are not albuminoids. One more brief table will present this more clearly: In 100 parts of the nitrogenous bodies in the juices—

DIFFUSION.	Albuminoids.	Non-Albuminoids.
With cold water	25.0 per cent.	75.0 per cent.
At 150 degrees F	10.9 per cent.	89.1 per cent.

In speaking of the excess of nitrogen taken out by diffusion in comparison with the nitrogen found in the normal mill juice, an explanation is necessary here. In the tables given showing the nitrogen contained in the mill and diffusion juices, in obtaining the samples of the mill juice a two-roller hand mill was used. This small mill expresses little more than one-half of the juice in the cane, and there was some doubt whether this juice was a fair sample. It could contain more of some bodies and less of others than a sample which had been obtained by a mill that expressed more nearly the whole of the juice. In January the new nine-roller mill came to the Station, and an examination was made of the nitrogenous bodies contained in the juice from this nine-roller mill, which expressed about 90 per cent. of the total juice, in comparison with those bodies found in the juice obtained by diffusion from the same cane. In grinding with the large mill, hot and cold water were used which not only increased the extraction to what has been stated, but gave to the juice somewhat the character of the diffusion juice. The following table shows the nitrogen contained in the juices obtained by diffusion at 150 deg. F., with the mill and cold water maceration, and the mill with hot water maceration:

NITROGEN.	JUICES.		
	Diffusion at 150 degrees F.	Mill, cold maceration.	Mill, hot maceration.
Total nitrogen in 100 cc. juice......	0.06352 grams.	0.05949 grams.	0.06238 grams.
Albuminoid nitrogen 100 cc. juice..	0.01856 grams.	0.02827 grams.	0.03060 grams.
Albuminoids in total solids in the juice........................	0.76 per cent.	1.176 per cent.	1.27 per cent.

In another table these results can be expressed more briefly, showing the relative proportions of albuminoids and non-albuminoids in 100 parts of the nitrogenous bodies present in those juices:

JUICES.	Albumminoids.	Non-Albuminoids.
Diffusion	30.4 per cent.	69.6 per cent.
Mill (cold maceration)....................	48.4 per cent.	51.6 per cent.
Mill (warm maceration)	49.0 per cent.	51.0 per cent.

It must first be said that the "hot maceration" was not really hot. The warm water added did not very materially raise the temperature of the bulk of the juice, and it is seen that the "hot" and "cold" water added give very nearly the same results, the warm water dissolving a little more albuminoids, and yet not warm enough to coagulate those bodies, which, it is again shown, was clearly done by the diffusion at 150 degrees F. The comparison of the results obtained with the juice from the nine roller mill and diffusion juice brings out the same facts in a modified form, which were shown by the small hand mill in comparison with diffusion, viz.: Diffusion extracts more total nitrogen than is expressed by the mill; and also diffusion, when conducted at a temperature high enough to coagulate the albuminoids, leaves a large proportion of those bodies behind in the chips, and at the same time dissolves out an excess of the non-albuminous nitrogen bodies. The action of the diffusion upon the nitrogenous impurities present in cane juice, which has been shown, suggests an explanation of the cause why diffusion juices do not clarify as readily as mill juice does. The albuminoids are the bodies which coagulate and form the "blanket" when the juice is heated in the clarifiers. When the albuminoids coagulate and rise to the surface most probably they lift many of the mucilaginous (gums) bodies with them, and this I have proved to be the case where lime is acting with heat upon those bodies in clarification. Diffusion coagulates and leaves the albuminoids largely behind in the chips, however, and their good effect in the clarifiers is lost. Moreover, diffusion extracts an excess of those nitrogen bodies which are not albuminoids, and which do not coagulate and become removed by our clarification methods. With our present knowledge, the explanation given, "why diffusion juices are more difficult to handle in clarification than mill juice," appears to be the most probable one.

THE CHEMICAL NATURE OF THE NON-ALBUMINOID NITROGENOUS BODIES IN CANE JUICE.

These bodies, vegetable chemistry suggests, could comprise amide compounds, small amounts of alkaloids, salts of nitric acid and ammonia. I found but a mere trace of an alkaloid body present, and no ammonia. And as several chemists have found no nitric acid in their analysis of the mineral acids present in cane juice, no account was taken of mineral nitrogen, the research being directed to the evident presence of large quantities of amide bodies.

Samples of cane juice were treated with sub-acetate of lead and all the impurities removed which that reagent precipitates (the amides are not thrown down with lead acetate).

After filtration the excess of lead was removed from the filtrate with sulphide of hydrogen. The clear cane juice, from which most of the organic impurities had been removed, was treated with nitrate of mercury, which is the characteristic precipitant of the amide bodies. The mercury nitrate at once showed the presence of notable quantities of amides.

As the amide compounds are always more largely present in vegetable organisms in the early stage of growth, quantities of very young cane "suckers" were collected and an investigation made with this material. Crystallized preparations were obtained of asparagin directly and without precipitation with mercury nitrate.

The discovery of asparagin in the fresh juice of the suckers and cane led me to look for aspartic acid in samples of cane molasses, and crystallized preparations were obtained. Asparagin is converted into aspartic acid under the action of alkalies and heat, and this conversion will more or less completely take place in the clarifiers, thus causing the presence of aspartic acid in the molasses:

$$C_2H_3(NH_2)\begin{matrix}CO\text{-}NH_2\\CO\text{-}OH\end{matrix} + H_2O = C_2H_3(NH_2)\begin{matrix}CO\text{-}OH\\CO\text{-}OH\end{matrix} + NH_3$$

Asparagine. Aspartic acid.

Asparagine is almost invariably accompanied by glutamine, which is an amide closely allied to asparagine, and although not yet identified, it is almost certain to be present in cane juice. Glutamine yields glutamic acid when heated with lime water:

$$C_3H_5(NH_2)\begin{matrix}CO\text{-}NH_2\\CO\text{-}OH\end{matrix} + H_2O = C_3H_5(NH_2)\begin{matrix}CO\text{-}OH\\CO\text{-}OH\end{matrix} + NH_3$$

Glutamine. Glutamic acid.

The preparations of amides obtained from the cane juice, when heated with lime water, yielded free ammonia, which is given off when amides having the given molecular constitution are heated with lime or baric hydrate. We have here an explanation of the giving off of ammonia, which sugar makers have spoken of as taking place in the clarifiers and effects. When lime is added in the clarifiers and the heat is turned on, the amides containing two atoms of nitrogen are attacked, and are caused to yield up one atom, which is loosely connected with the amide body, and that is given off in the form of ammonia. Scientifically speaking, one amidogen is displaced by a hydrozyl radicle, which is shown in the formulæ of asparagine and glutamine given.

The lime which is used in the clarifiers can also act upon the albuminoid bodies, when ammonia is also given off as one of the decomposition products. In order to observe the action of the lime upon the albuminoids, whilst studying the precise effect of that reagent upon the amides in the cane juice, the albuminoids were determined in given samples of juice before, and again after, boiling those juices for one hour under a condenser, with lime added to slight alkalinity. At the end of one hour 18.6 per cent. of the albuminoids in the juice had been converted by the lime into amides and some free ammonia. These facts indicate that care is required in using lime in clarification; and it is clearly suggested that as soon as the "blanket" is formed it should be removed and not broken up, by turning on the steam in the clarifiers to a boil. If that is done the "blanket" is broken to pieces, and the great heat with the lime will decompose some of the albuminoids.

In the vegetable organism the amide bodies bear a relation to the albuminoids, and exercise a function, similar to that of glucose to starch and cane sugar. In the mature seed the nitrogen is present very chiefly in the form of albuminoids; when the seed germinates the albuminoids under the action of the vegetable ferments, gradually become oxydized and resolved into these several kinds of amides. The amides being water soluble bodies, are easily transported to different parts of the plantlet and furnish the nitrogen necessary to its growth, behaving in these respects like glucose, which body furnishes material for both the nitrogenous and non-nitrogenous tissues of plants. When the plant develops and finally approaches maturity, the excess of amide bodies disappears, these bodies, in union with carbohydrates, undergoing a process of reduction, whereby they revert to the albuminoid form. According to this mode of reversion we should not only expect to find a maximum amount of amides in the young suckers, but on the other hand, as the cane comes to maturity, we should find the proportion of amides decreasing and an increase of the same proportion in the amount of albuminoids. The following brief table will show what was actually observed at different ages and stages of development, between November and January inclusive. The analyses were made with mill juice from purple cane that had not been injured by frost. The figures give the albuminoids and amides in 100 parts of the nitrogenous substances:

	Albuminoids.	Amides.
November 10th	34.3 per cent.	65.7 per cent.
January 19th	48.4 per cent.	51.6 per cent.
January 30th	57.1 per cent.	42.9 per cent.

In countries where the cane reaches a greater maturity than in Louisiana before it is worked the albuminoids will still further predominate.

The composition of the nitrogenous bodies found in the clarified juices may now be considered. This will be most readily done by giving the estimation of total nitrogen and albuminoids, and observing what changes have been caused in the clarifiers in the total and relative amounts of the nitrogenous matters. In the following tables the data relate to the clarified juices of Run I and Run II, which juices correspond to the diffusion juices of those "runs," and to which the first tables given were devoted. The analyses show the nitrogen contained in 100 cc. of juice, and the calculations are based upon the total solids of the original mill juices obtained from the cane in the "runs."

JUICES.	RUN II.	RUN II.
	Striped cane, Total Nitrogen.	Purple cane, Total nitrogen.
Mill juice (100 cc.)	0.03156 grams.	0.03220 grams.
Diffus on (100 cc.)	0.0350 grams.	0.03320 grams.
Clarified (100 cc.)	0.0230 grams.	0.0205 grams.

Both in the example of the striped and purple cane juices a decrease in the total nitrogen of one-third the amount had taken place.

The following table gives the albuminoids in the clarified juice and their per cent. of the total solids; compared with the mill and diffusion juices:

JUICE.	RUN. I. STRIPED CANE.		RUN II. PURPLE CANE.	
	Albuminoids in juice.	Albuminoids in total solids.	Albuminoids in juice.	Albuminoids in total solids.
Mill	0.063 per cent.	0.44 per cent.	0.066 per cent.	0.46 per cent.
Diffusion	0.048 per cent.	0 34 per cent.	0.050 per cent.	0.35 per cent.
Clarified.......	0.010 per cent.	0.07 per cent.	0.008 per cent.	0.06 per cent.

In 100 parts of the nitrogenous matters contained in the mill, diffusion and clarified juices the relative proportions of the albuminoids and amides were as follows:

JUICE.	RUN I. STRIPED CANE.		RUN II. PURPLE CANE.	
	Albuminoids.	Amides.	Albuminoids.	Amides.
Mill...........	35.0 per cent.	65.0 per cent.	34.3 per cent.	65 7 per cent.
Diffusion	24 3 per cent.	75.7 per cent.	25.0 per cent.	75.0 per cent.
Clarified	5.1 per cent.	94.9 per cent.	4.2 per cent.	95.8 per cent

In these tables the analyes of the mill juices are only reproduced in order to offer a complete view of the whole, but the present comparisons are to be made between the diffusion and clarified juices.

The first of these three tables shows that the total nitrogen found in the diffusion juices was reduced by one-third in the clarifiers. The second table shows that the clarifiers did not remove all the albuminoids, about one-fifth of the total amount being still left in the juice. Experiment allows us to believe that the four-fifths of the albuminoids, which are shown by analysis to have disappeared, have been chiefly removed from the juice, although an experiment has already been mentioned which showed that lime in the clarifiers *can* convert some albuminoids into amides, but the action of lime is comparatively slow upon the albuminoids, and very much more rapid in converting asparagine into aspartic acid. The decreased quantity of albuminoids found in the clarified juice then may be said to be due chiefly to the actual removal of the greater part from the juice, and to a conversion of a small part into amids.

The decrease in the total nitrogen found in the clarified in comparison with the diffusion juice is owing to the removal of the largest part of the albuminoids; to the conversion of a small part of albumiuoids into amides, whereby some free ammonia is given off; and to the conversion of asparagine and possibly glutamine, into aspartic and glutamic acids, in which reactions free ammonia is also given off. Just how much of the albuminoids are converted into amides and ammonia, and how much asparagine into aspartic acid, it was impossible to ascertain in the attempt to keep up with the sugar-house run. Only the most careful laboratory experiments could furnish reliable data thereon.

Upon the discovery of large quantities of amide bodies in cane juice the question arose: How are the nitrogenous bodies in the juice to be calculated from the nitrogen found? The albuminoids are determined by absolute estimation, the calculation being made by multiplying the albuminous nitrogen with the factor 6, which I have considered to be the safest number to use (the albuminoid estimation may be a little too high where asparic acid is present, because of the liability of that acid, in some conditions, to form an insoluble aspartate of copper; the error is not certain, and in any case a small one, not seriously affecting the correctness of the albuminoid determination.) The sum of the atomic values of a molecule of asparagine is 132, and asparagine containing two atoms of nitrogen the latter would be 28. Therefore 132 divided by 28 equals 4.7. The molecular value of aspartic acid is 133; but aspartic acid contains only one atom of nitrogen; therefore 133 divided by 14 equals 9.5. So that the factor for calculating asparagine from the nitrogen found would be 4.7; and the factor for aspartic acid 9.5. I believe, however, that the common factor 6 may be generally used in calculating all the nitrogen in fresh juice and for the reason that in the fresh juice the amides will be chiefly asparagine, although some aspartic acid is found. In the clarified juice, and particularly where heavy liming and hard boiling have been practiced the albuminoids will have been almost wholly removed, and the asparagine will have been converted almost wholly into aspartic acid, in which case the factor 9.5 will have been converted almost wholly into aspartic acid, in which case the factor 9.5 will be not far from correct. This short explanation, I think, will be enough without using time further upon the more scientific features of the work.

Numerous experiments were made in the laboratory upon processes for removing the amide bodies from the juice in clarification. An experiment was also made in the sugar house, 600 pounds of low grade molasses being used, and any statement will be limited to this test on the larger scale. The composition of the molasses was as follows: Total solids were 468 pounds, of which 216 pounds were sucrose, 180 pounds glucose, and 42 pounds of organic solids not sugars. By a process which at present is too imperfect to justify the use of time in explaining, I succeeded in removing 40 pounds of those impurities, which weight included not only the amides but also all of the so-called "gums." After removing these organic impurities, the sugar liquid was boiled down in the small pan, and although a small grain began to form, the grain would not grow and the boiling was stopped when about 5 gallons of dense syrup containing small grain were taken out of the pan. This dense syrup stood in my laboratory, under every variation of temperature. for eight weeks, when it was found that an excellent crystallization had taken place. The sugar was swung out in the centrifugal and 53 per cent. of the whole was obtained. Had there been enough of the syrup to fill a wagon, and it had been kept in hot room, the yield would have been necessarily much larger. I do not think it advisable to say more about this experiment until it is repeated and under more exact conditions. The first part of these investigations may be summed up by repeating that the nitrogenous impurities contained in the cane juice are composed of about one-third of albuminoids and about two-thirds of amide bodies. Also that all the amide bodies, with a small part of the albuminoids, by our present methods of clarification, are not removed, but pass into the masse cuite and molasses. The amides and also the gums can be removed by a process which requires further consideration.

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The merchants of Monnett, Mo., have adopted a novel method of collecting bad debts. They employ the handsomest girls to be obtained to do their collecting, and the plan seems to be a succeess.—*Penn. Grocer.*

COFFEE.

Messrs. W. H. Crossman & Bro., importers, have addressed a cicular letter to the trade bearing upon the coffee supply. It says:

"Receipts in Rio and Santos to this point indicate a total yield nearer to 6,000,000 than 5,000,000 bags. The average date for ten years, when one-third of the crop has been marketed in Rio and Santos, is about the middle of October, and already 2,250,000 bags have been sent down. If, therefore, Rio and Santos will give more than expected on this crop, it will be quite interesting to figure out what may be expected from all the other crops. No one will deny that these crops have constantly improved in yield since the cultivation of the bean has been so very profitable, with the exception of brief periods of depression here and there; planters have secured a very heavy return on their outlay, and we keep within conservative limits when stating that profits of 100 to 200 per cent. are quite frequent in raising coffee, according to the cost of labor and other conditions on which plantations are conducted."

They estimate all crops outside of Brazil at 5,564,000 bags, and on a basis of 5,500,000 bags from Brazil figure a total supply of 11,000,000 bags, which is about equal the world's consumption. In relation to the next campaign the circular says:

"As regards the growing crops in Rio and Santos, reports of the prospects are uniformly favorable. The peculiarity this year is that not a dissenting voice is heard regarding the probabilities of a large crop, and where opinions have shaped themselves into figures a total of about 8,000,000 bags is conservatively expressed for the Rio and Santos crops.

"Coffee values this year are 20 per cent. higher compared with a year ago. This advance is supported entirely by the anticipated decrease in supplies that was to assert itself at the present time. Instead of that, what do we see—a visible supply that is 10 per cent. larger, and confirmed prospect of a growing crop that will exceed anything on record. The total coffee crops of 1894–95 gave a yield that was in excess of any previous season, and after all, the combined yield of the 1896–97 crops will be even larger We do not assert this upon what the crops in Brazil may give, but pin our faith on the almost absolute certainty of a substantial gain in the total production from all the outside crops."